

APPENDIX C

CONSULTATION DOCUMENTATION

C. CONSULTATION DOCUMENTATION

Consultations were initiated in late 2013/early 2014 and completed in February 2015, before publication of the Final EIS.

Click on [hyperlinks](#) to jump to an element, and hold down the “Alt” key while pressing the “left-arrow” key to GO BACK.

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The following items are included in this appendix.

[C.1 Cultural Resources Consultation Documentation and Correspondence](#)

[C.1.1 Cultural Consultation Written Correspondence Timeline](#)

[C.1.2 Cultural Consultation Phone Call and General Response Correspondence Timeline](#)

[C.1.3 Cultural Consultation Letters](#)

[C.2 Coastal Zone Consistency Act \(CZMA\) Determination](#)

[C.3 Biological Assessment](#)

[C.4 Programmatic Agreement](#)

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C.1 CULTURAL RESOURCES CONSULTATION DOCUMENTATION AND CORRESPONDENCE

C.1.1 Cultural Consultation Written Correspondence Timeline

Date	To	From	Notes
12/18/2013	Thlopthlocco Tribal Town THPO	Air Force	Invitation to Tribe to review and comment on GRASI project and DOPPA.
12/18/2013	Muscogee (Creek) Nation THPO	Air Force	Invitation to Tribe to review and comment on GRASI project and DOPPA.
12/18/2013	Miccosukee Tribe of Indians of Florida THPO	Air Force	Invitation to Tribe to review and comment on GRASI project and DOPPA.
12/18/2013	Poarch Band of Creek THPO	Air Force	Invitation to Tribe to review and comment on GRASI project and DOPPA.
12/18/2013	Seminole Tribe of Florida THPO	Air Force	Invitation to Tribe to review and comment on GRASI project and DOPPA.
12/18/2013	Seminole Tribe of Florida Compliance Review Section	Air Force	Invitation to Tribe to review and comment on GRASI project and DOPPA.
12/18/2013	Florida SHPO	Air Force	Invitation to SHPO to review and comment on GRASI project and DOPPA.
12/18/2013	ACHP	Air Force	Invitation to ACHP to review and comment on GRASI project and DOPPA.
1/3/2014	Air Force	ACHP	ACHP will not participate in consultation unless requested by SHPO, THPO or another party. MOA will need to be filed with ACHP.
3/26/2014	Miccosukee Tribe of Indians of Florida Chairman; Muscogee (Creek) Nation Principal Chief; Poarch Band of Creek Indians Tribal Chairman; Seminole Tribe of Florida Chairman; Thlopthlocco Tribal Town King	Air Force: Brigadier General David A. Harris, Commander, 96 th Test Wing	Government-to-Government consultation on development of a Programmatic Agreement for the GLI.
10/28/2014	Miccosukee Tribe of Indians of Florida THPO; Muscogee (Creek) Nation THPO; Poarch Band of Creek THPO; Seminole Tribe of Florida Compliance Review Section; Seminole Tribe of Florida THPO; Thlopthlocco Tribal Town THPO; Florida Forest Service; Florida SHPO	Air Force	Delivery of draft <i>PA Among Eglin Air Force Base and the Florida State Historic Preservation Office Regarding the Proposed Gulf Regional Airspace Strategic Landscape Initiative</i> for review and request for comment.

C.1.2 Cultural Consultation Phone Call and General Response Correspondence Timeline

Call/ Letter/ Email From	Call/ Letter/ Email To	Phone #	Tribe Name	Date of Corres- pondence	Time	Actual Contact/ Response Received	Comments	Concerns Raised	Concurrence
Air Force	Charles Colman	405-220-2185	Thlopthlocco Tribal Town	1/23/14	1400 & 1417		Busy		
Air Force	Bradley Mueller	863-983-6549 Ext 12245	Seminole Tribe of Florida	1/23/14	1358 & 1414		busy Not in		
Air Force	Robert Thrower	251-253-5620	Poarch Band of Creek	1/23/14	1350 & 1417		Busy Not available		
Air Force	Fred Dayhoff	239-695-4360	Miccosukee Tribe of Indians	1/23/14	1402 & 1415		Busy		
Air Force	Emman Spain	918-894-8690	Muscogee (Creek) Nation	1/23/14	1345 & 1416		Busy		
Air Force	Charles Colman	405-220-2185	Thlopthlocco Tribal Town	1/24/14	0908 & 0916	Colman returned call	Not in/left message Emailing him a copy of the package/ indicated he will most likely wait till PA is available for comment		
Air Force	Bradley Mueller	863-983-6549 Ext 12245	Seminole Tribe of Florida	1/24/14	0902 & 1111		Not in/left message		
Air Force	Robert Thrower	251-253-5620	Poarch Band of Creek	1/24/14	0910		Not in/ left message.		

Call/ Letter/ Email From	Call/ Letter/ Email To	Phone #	Tribe Name	Date of Corres- pondence	Time	Actual Contact/ Response Received	Comments	Concerns Raised	Concurrence
Air Force	Fred Dayhoff	239-695- 4360	Miccosukee Tribe of Indians	1/24/14	0905	Fred Dayhoff	Not responding, wishes to be notified if human remains are found/missio n must cease immediately		
Air Force	Emman Spain	918-894- 8690	Muscogee (Creek) Nation	1/24/14	0906		Number disconnected		
Air Force	Bradley Mueller	863-983- 6549 Ext 12245	Seminole Tribe of Florida	2/5/14	1002 & 1404		Not in		
Air Force	Robert Thrower	251-253- 5620	Poarch Band of Creek	2/5/14	1004 & 1405		Not in		
Air Force	Emman Spain	918-894- 8690	Muscogee	2/5/14	1005 & 1405		Number disconnected		
Air Force	Bradley Mueller	863-983- 6549 Ext 12245	Seminole Tribe of Florida	2/7/14	0920	Bradley Mueller	Is double checking with compliance. "If Eglin does not receive a response the tribe has no comments".		
Air Force	Robert Thrower	251-253- 5620	Poarch Band of Creek	2/7/14	0925		Not in		
Air Force	Emman Spain	918-894- 8690	Muscogee (Creek) Nation	2/7/14	0927		Number disconnected		

C.1.3 Cultural Consultation Letters



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

18 DEC 2013

Mr. Emman Spain
Tribal Historic Preservation Officer
Muscogee (Creek) Nation
P.O. Box 580
Okmulgee OK 74447

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Spain

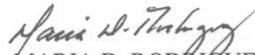
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Eglin would like to invite you to participate in the review of this project. Eglin requests that you review the DOPAA and provide any comments that you may have within 30 days of receiving this letter. Should we not receive a response from your office within the 30-day comment period, Eglin will assume that you have no objections to the implementation of this proposed action identified in the DOPAA.

Enclosed with this letter are a copy of the GRASI DOPAA (Attachment 1) and a copy of the Florida Forest Service MOA (Attachment 2) concerning military training proposed within state parks. Also included is a table of research conducted concerning previous archaeological studies in the APE (Attachment 3) and maps created to visually demonstrate the archaeological work completed in the state forests (Attachment 4). Attachment 5 is a map of timber harvesting locations provided by the State Forests. All attachments are included on the enclosed CD.

Please contact Shawn Arnold, 96 CEG/CEIEA at phone 850-883-5222 or email william.arnold@eglin.af.mil, if you have any questions.

Sincerely



MARIA D. RODRIGUEZ, GS-14
Chief, Environmental Management Branch

Enclosed:
1 CD with 5 Attachments



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

18 DEC 2013

Reid Nelson, Director
Office of Federal Agency Programs
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 803
Washington DC 20004

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Nelson

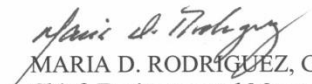
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Chief, Environmental Management Branch

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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

18 DEC 2013

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Mr. Fred Dayhoff
NAGPRA/Section 106 Representative
Miccosukee Tribe of Indians of Florida
P.O. Box 440021
Miami FL 33144

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Dayhoff

Eglin AFB wishes to comprehensively meet its management responsibilities in a manner that balances its regulatory obligations with its need for operational flexibility. Recently the Deputy Assistant Secretary of the Air Force for Installations entered a Memorandum of Agreement (MOA) with the Florida Department of Agriculture and Consumer Services, Florida Forest Service in order to conduct military training in Blackwater River State Forest and Tate's Hell State Forest. This MOA led to the development of the attached DOPAA. The Area of Potential Effect (APE) is defined as the entire area of the two State Forests. Potential for adverse effect due to ground disturbing training activities is being assessed in the forthcoming EIS.

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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

18 DEC 2013

Mr. Robert G. Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore AL 36502

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Thrower


Eglin AFB wishes to comprehensively meet its management responsibilities in a manner that balances its regulatory obligations with its need for operational flexibility. Recently the Deputy Assistant Secretary of the Air Force for Installations entered a Memorandum of Agreement (MOA) with the Florida Department of Agriculture and Consumer Services, Florida Forest Service in order to conduct military training in Blackwater River State Forest and Tate's Hell State Forest. This MOA led to the development of the attached DOPAA. The Area of Potential Effect (APE) is defined as the entire area of the two State Forests. Potential for adverse effect due to ground disturbing training activities is being assessed in the forthcoming EIS.

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EGLIN AIR FORCE BASE FLORIDA

18 DEC 2013

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Paul N. Backhouse, Ph.D.
Tribal Historic Preservation Office
Seminole Tribe of Florida
30290 Josie Billie Highway, PMB 1004
Clewiston FL 33440

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Dr. Backhouse

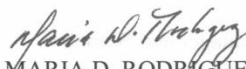
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EGLIN AIR FORCE BASE FLORIDA

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

18 DEC 2013

Bradley M. Mueller, M.A., Supervisor
Compliance Review Section
Seminole Tribe of Florida
30290 Josie Billie Highway, PMB 1004
Clewiston FL 33440

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Mueller

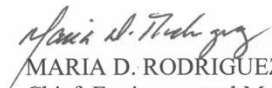
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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

18 DEC 2013

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Robert F. Bendus, Director
Division of Historical Resources
R.A. Gray Building
500 South Bronough Street
Tallahassee FL 32399-0250

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Bendus

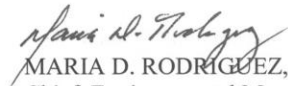
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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

18 DEC 2013

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Mr. Charles Coleman
Tribal Historic Preservation Officer
Thlopthlocco Tribal Town
P.O. Box 188
Okemah OK 74859-0188

RE: *Gulf Regional Airspace Strategic Initiative (GRASI) Description of Proposed Action and Alternatives (DOPAA)*

Dear Mr. Coleman

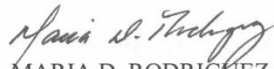
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Sincerely



MARIA D. RODRIGUEZ, GS-14
Chief, Environmental Management Branch

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Preserving America's Heritage

January 3, 2014

Brigadier General David A. Harris
Commander
Eglin Air Force Base
96 TW/CC
101 West D Avenue, Suite 132
Eglin Air Force Base, FL 32542-5495

Ref: *Proposed Gulf Regional Airspace Strategic Initiative (GRASI) Landscape Initiative between the State of Florida and the 96th Test Wing at Eglin Air Force Base Santa Rosa, Okaloosa, and Franklin Counties, Florida*

Dear Brig Gen Harris:

The Advisory Council on Historic Preservation (ACHP) received your notification and supporting documentation regarding the adverse effects of the referenced undertaking on properties listed on and eligible for listing in the National Register of Historic Places. Based upon the information you provided, we have concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of our regulations, "Protection of Historic Properties" (36 CFR Part 800) does not apply to this undertaking. Accordingly, we do not believe that our participation in the consultation to resolve adverse effects is needed. However, if we receive a request for participation from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or another party, we may reconsider this decision. Additionally, should circumstances change, and you determine that our participation is needed to conclude the consultation process, please notify us.

Pursuant to 36 CFR 800.6(b)(1)(iv), you will need to file the final Memorandum of Agreement (MOA), developed in consultation with the Florida State Historic Preservation Officer (SHPO) and any other consulting parties, and related documentation with the ACHP at the conclusion of the consultation process. The filing of the Agreement and supporting documentation with the ACHP is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with your notification of adverse effect. If you have any questions or require further assistance, please contact Katharine Kerr at 202-606-8534, or via email at kkerr@achp.gov.

Sincerely,

Raymond V. Wallace
Historic Preservation Technician
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION
1100 Pennsylvania Avenue NW, Suite 803 • Washington, DC 20004
Phone: 202-606-8503 • Fax: 202-606-8647 • achp@achp.gov • www.achp.gov



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Brigadier General David A. Harris
 Commander, 96th Test Wing
 100 West D Avenue, Suite 118
 Eglin AFB FL 32542-5105

Mr. Colley Billie
 Chairman
 Miccosukee Tribe of Indians of Florida
 Tamiami Station
 PO Box 440021
 Miami FL 33144

Re: Resolving Adverse Effects Resulting from the Gulf Regional Airspace Strategic Initiative (GRASI) Military Training Program

Dear Chairman Billie

Eglin Air Force Base (AFB) in Okaloosa County, Florida is initiating government-to-government consultation with your tribe on developing a Programmatic Agreement (PA) for the GRASI military training program, as further described below. A PA is needed to comply with Section 106 of the *National Historic Preservation Act* and its implementing regulations at 36 CFR Part 800. Under 36 CFR § 800.5 Eglin AFB has determined that the GRASI military training program may adversely affect properties listed in or eligible for listing in the *National Register of Historic Places (NRHP)*. Eglin AFB invites the tribe to participate as a concurring party in developing the PA for the GRASI military training program.

As described in our letter to the tribe dated 13 December 2013, GRASI is a training program that will enable Eglin AFB and other Department of Defense facilities in the Florida Gulf region to expand military training opportunities for the future. GRASI is the product of a joint military and civilian planning effort designed to meet growing military air and ground training needs in the Gulf region. Eglin AFB, in cooperation with the State of Florida, proposes to utilize various portions of two existing state forests to conduct nonhazardous military activities: Blackwater River State Forest (BRSF) and Tate's Hell State Forest (THSF) (Atch 1). Both state forests are located in the Florida Panhandle and are easily accessible by air. Twelve locations throughout Northwest Florida are also needed for mobile radar, telemetry, and training emitter sites. These sites will be less than 0.5 acres and have been previously developed. Eleven of the proposed 12 emitter sites are located on land owned by the State of Florida Forest Service or Florida Fish and Wildlife Conservation Commission lands. One site is on Eglin AFB property. Each of the 12 emitter sites has been heavily disturbed by previous development and is unlikely to contain intact cultural resources (Atch 2).

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Eglin AFB requests that the Miccosukee Tribe of Indians of Florida provide any information that you can share on places of traditional and cultural significance within the BRSF and THSF project areas, and that could also be adversely affected by the proposed training mission. Maps of the two state forests are attached along with summary information on known cultural resources for your review (Atch 3). Please inform my office if your tribe wishes to participate in developing the PA and will be joining the PA as a concurring party.

If you have any questions or comments about the GRASI military training program or its potential adverse effects at this point, please contact me.

Sincerely



DAVID A. HARRIS
Brigadier General
Commander

cc:

Mr. Steve Terry
NAGPRA and Section 106 Representative
Miccosukee Tribe of Indians of Florida
Tamiami Station
PO Box 440021
Miami FL 33144

3 Attachments:

1. Map of State Forest Locations
2. Map of Potential Emitter Locations
3. CD containing Maps of Known Archaeological Sites in the State Forests



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Brigadier General David A. Harris
Commander, 96th Test Wing
100 West D Avenue, Suite 118
Eglin AFB FL 32542-5105

Mr. George Tiger
Principal Chief
Muscogee (Creek) Nation
Office of the Administration
P.O. Box 580
Okmulgee OK 74447

Re: Resolving Adverse Effects Resulting from the Gulf Regional Airspace Strategic Initiative
(GRASI) Military Training Program

Dear Principal Chief Tiger

Eglin Air Force Base (AFB) in Okaloosa County, Florida is initiating government-to-government consultation with your tribe on developing a Programmatic Agreement (PA) for the GRASI military training program, as further described below. A PA is needed to comply with Section 106 of the *National Historic Preservation Act* and its implementing regulations at 36 CFR Part 800. Under 36 CFR § 800.5 Eglin AFB has determined that the GRASI military training program may adversely affect properties listed in or eligible for listing in the *National Register of Historic Places (NRHP)*. Eglin AFB invites the tribe to participate as a concurring party in developing the PA for the GRASI military training program.

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Eglin AFB requests that the Muscogee (Creek) Nation provide any information that you can share on places of traditional and cultural significance within the BRSF and THSF project areas, and that could also be adversely affected by the proposed training mission. Maps of the two state forests are attached along with summary information on known cultural resources for your review (Atch 3). Please inform my office if your tribe wishes to participate in developing the PA and will be joining the PA as a concurring party.

If you have any questions or comments about the GRASI military training program or its potential adverse effects at this point, please contact me.

Sincerely



DAVID A. HARRIS
Brigadier General
Commander

cc:

Mr. Emman Spain, THPO
Cultural Preservation Office
PO Box 580
Ocmulgee OK 74447

3 Attachments:

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2. Map of Potential Emitter Locations
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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Brigadier General David A. Harris
Commander, 96th Test Wing
100 West D Avenue, Suite 118
Eglin AFB FL 32542-5105

Mr. Buford L. Rolin
Tribal Chairman
Chairman
Poarch Band of Creek Indians
5811 Jack Spring Road
Atmore AL 36502

Re: Resolving Adverse Effects Resulting from the Gulf Regional Airspace Strategic Initiative
(GRASI) Military Training Program

Dear Tribal Chairman Rolin

Eglin Air Force Base (AFB) in Okaloosa County, Florida is initiating government-to-government consultation with your tribe on developing a Programmatic Agreement (PA) for the GRASI military training program, as further described below. A PA is needed to comply with Section 106 of the *National Historic Preservation Act* and its implementing regulations at 36 CFR Part 800. Under 36 CFR § 800.5 Eglin AFB has determined that the GRASI military training program may adversely affect properties listed in or eligible for listing in the *National Register of Historic Places (NRHP)*. Eglin AFB invites the tribe to participate as a concurring party in developing the PA for the GRASI military training program.

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Eglin AFB requests that the Poarch Band of Creek Indians provide any information that you can share on places of traditional and cultural significance within the BRSF and THSF project areas, and that could also be adversely affected by the proposed training mission. Maps of the two state forests are attached along with summary information on known cultural resources for your review (Atch 3). Please inform my office if your tribe wishes to participate in developing the PA and will be joining the PA as a concurring party.

If you have any questions or comments about the GRASI military training program or its potential adverse effects at this point, please contact me.

Sincerely



DAVID A. HARRIS
Brigadier General
Commander

cc:

Mr. Robert G. Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore AL 36502

3 Attachments:

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Brigadier General David A. Harris
Commander, 96th Test Wing
100 West D Avenue, Suite 118
Eglin AFB FL 32542-5105

Mr. James E. Billie
Chairman
Seminole Tribe of Florida
6300 Stirling Road
Hollywood FL 33024

Re: Resolving Adverse Effects Resulting from the Gulf Regional Airspace Strategic Initiative
(GRASI) Military Training Program

Dear Chairman Billie

Eglin Air Force Base (AFB) in Okaloosa County, Florida is initiating government-to-government consultation with your tribe on developing a Programmatic Agreement (PA) for the GRASI military training program, as further described below. A PA is needed to comply with Section 106 of the *National Historic Preservation Act* and its implementing regulations at 36 CFR Part 800. Under 36 CFR § 800.5 Eglin AFB has determined that the GRASI military training program may adversely affect properties listed in or eligible for listing in the *National Register of Historic Places (NRHP)*. Eglin AFB invites the tribe to participate as a concurring party in developing the PA for the GRASI military training program.

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Eglin AFB requests that the Seminole Tribe of Florida provide any information that you can share on places of traditional and cultural significance within the BRSF and THSF project areas, and that could also be adversely affected by the proposed training mission. Maps of the two state forests are attached along with summary information on known cultural resources for your review (Atch 3). Please inform my office if your tribe wishes to participate in developing the PA and will be joining the PA as a concurring party.

If you have any questions or comments about the GRASI military training program or its potential adverse effects at this point, please contact me.

Sincerely



DAVID A. HARRIS
Brigadier General
Commander

cc:

Dr. Paul N. Backhouse
Tribal Historic Preservation Officer
30290 Josie Billie Hwy, PMB 1004
Clewiston FL 33440

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

Brigadier General David A. Harris
Commander, 96th Test Wing
100 West D Avenue, Suite 118
Eglin AFB FL 32542-5105

Mr. George Scott
Town King
Thlopthlocco Tribal Town
P.O. Box 188
Okemah OK 74859-0188

Re: Resolving Adverse Effects Resulting from the Gulf Regional Airspace Strategic Initiative (GRASI) Military Training Program

Dear Town King Scott

Eglin Air Force Base (AFB) in Okaloosa County, Florida is initiating government-to-government consultation with your tribe on developing a Programmatic Agreement (PA) for the GRASI military training program, as further described below. A PA is needed to comply with Section 106 of the *National Historic Preservation Act* and its implementing regulations at 36 CFR Part 800. Under 36 CFR § 800.5 Eglin AFB has determined that the GRASI military training program may adversely affect properties listed in or eligible for listing in the *National Register of Historic Places (NRHP)*. Eglin AFB invites the tribe to participate as a concurring party in developing the PA for the GRASI military training program.

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Sincerely



DAVID A. HARRIS
Brigadier General
Commander

cc:

Mr. Charles Coleman
Tribal Historic Preservation Officer
Thlopthlocco Tribal Town
P.O. Box 188
Okemah OK 74859-0188

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

John Browne
Land Programs Administrator
Florida Forest Service
The Conner Building
3125 Conner Boulevard, Room 236
Tallahassee FL 32399-1650

Dear Mr. Browne

Enclosed with this letter is a draft copy of the *Programmatic Agreement Among Eglin Air Force Base and The Florida State Historic Preservation Officer Regarding The Proposed Gulf Regional Airspace Strategic Landscape Initiative*, as requested.

Eglin is again pleased to work with you in protecting the cultural resources of the Base and the state of Florida. Should you have any questions regarding the draft PA, please contact my representative Lynn Shreve at 850-883-5201.

Sincerely


For: MARIA D. RODRIGUEZ, GS-14
Chief, Environmental Management Branch

Attachment:

1. Draft *Programmatic Agreement Among Eglin Air Force Base The Florida State Historic Preservation Officer And The Florida Forest Service Regarding The Proposed Gulf Regional Airspace Strategic Landscape Initiative*



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Mr. Fred Dayhoff
NAGPRA/Section 106 Representative
Miccosukee Tribe of Indians of Florida
Tamiami Station
P.O. Box 440021
Miami FL 33144

Dear Mr. Dayhoff

In March 2014 Eglin informed the Miccosukee Tribe of Indians of Florida of our intention of entering into a Programmatic Agreement (PA) to resolve the adverse effects of an undertaking regarding the Gulf Regional Airspace Strategic Initiative Military training program. Eglin AFB, in cooperation with the State of Florida, proposes to utilize various portions of two existing state forests to conduct nonhazardous military activities: Blackwater River State Forest and Tate's Hell State Forest.

Enclosed with this letter is the draft copy of the *Programmatic Agreement (PA) Among Eglin Air Force Base and The Florida State Historic Preservation Officer Regarding The Proposed Gulf Regional Airspace Strategic Landscape Initiative*, for your review and recommendations.

We look forward to any comments you may have concerning the draft PA. Eglin would like to receive your comments within 30 to 45 days of receiving this letter to meet our comment period schedule. Please let us know if you require additional review time. We will also contact you by phone in order to ensure your receipt of this report.

Eglin is again pleased to work with the Miccosukee Tribe of Indians of Florida in protecting the cultural resources of the Base and the state of Florida. Should you have any questions regarding the PA, please contact my representative Lynn Shreve at 850-883-5201.

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EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
 Chief, Environmental Management Branch
 96 CEG/CEIE
 501 DeLeon Street, Suite 101
 Eglin AFB FL 32542-5105

Mr. Emman Spain
 Tribal Historic Preservation Officer
 Muscogee (Creek) Nation
 P.O. Box 580
 Okmulgee OK 74447

Dear Mr. Spain

In March 2014 Eglin informed the Muscogee (Creek) Nation of our intention of entering into a Programmatic Agreement (PA) to resolve the adverse effects of an undertaking regarding the Gulf Regional Airspace Strategic Initiative Military training program. Eglin AFB, in cooperation with the State of Florida, proposes to utilize various portions of two existing state forests to conduct nonhazardous military activities: Blackwater River State Forest and Tate's Hell State Forest.

Enclosed with this letter is a draft copy of the *Programmatic Agreement (PA) Among Eglin Air Force Base and The Florida State Historic Preservation Officer Regarding The Proposed Gulf Regional Airspace Strategic Landscape Initiative*, for your review and recommendations, as set forth in the *Memorandum of Understanding between Eglin AFB, Florida and the Muscogee (Creek) Nation for Consultation and Cooperation Pursuant to Section 106 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act*.

We look forward to any comments you may have concerning the draft PA. Eglin would like to receive your comments within 45 days of receiving this letter to meet our comment period schedule. Please let us know if you require additional review time. We will also contact you by phone in order to ensure your receipt of this report.

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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Bradley M. Mueller, M.A., Supervisor
Compliance Review Section
Seminole Tribe of Florida
30290 Josie Billie Highway, PMB 1004
Clewiston FL 33440

Dear Mr. Mueller


In March 2014 Eglin informed the Seminole Tribe of Florida of our intention of entering into a Programmatic Agreement (PA) to resolve the adverse effects of an undertaking regarding the Gulf Regional Airspace Strategic Initiative Military training program. Eglin AFB, in cooperation with the State of Florida, proposes to utilize various portions of two existing state forests to conduct nonhazardous military activities: Blackwater River State Forest and Tate's Hell State Forest.

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Paul N. Backhouse, Ph.D.
Tribal Historic Preservation Office
Seminole Tribe of Florida
30290 Josie Billie Highway, PMB 1004
Clewiston FL 33440

Dear Dr. Backhouse

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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Mr. Robert G. Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore AL 36502

Dear Mr. Thrower

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HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Robert F. Bendus, Director
Division of Historical Resources
R.A. Gray Building
500 South Bronough Street
Tallahassee FL 32399-0250


Re: DHR Project File No.: 2014-1669 (2013-5800)
Re: Gulf Regional Airspace Strategic Initiative (GRASI) Programmatic Agreement (PA)

Dear Mr. Bendus

In May of this year Eglin received your comments regarding the GRASI PA and incorporated them into the enclosed draft copy of the *Programmatic Agreement among Eglin Air Force Base and The Florida State Historic Preservation Officer Regarding the Proposed Gulf Regional Airspace Strategic Landscape Initiative*. We look forward to receiving any further recommendations you may have.

Eglin is again pleased to work with you in protecting the cultural resources of the Base and the state of Florida. Should you have any questions regarding the draft PA, please contact my representative Lynn Shreve at 850-883-5201.

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For: MARIA D. RODRIGUEZ, GS-14
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EGLIN AIR FORCE BASE FLORIDA

28 OCT 2014

Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB FL 32542-5105

Mr. Charles Coleman
Tribal Historic Preservation Officer
Thlopthlocco Tribal Town
P.O. Box 188
Okemah OK 74859-0188

Dear Mr. Coleman

In March 2014 Eglin informed the Thlopthlocco Tribal Town of our intention of entering into a Programmatic Agreement (PA) to resolve the adverse effects of an undertaking regarding the Gulf Regional Airspace Strategic Initiative Military training program. Eglin AFB, in cooperation with the State of Florida, proposes to utilize various portions of two existing state forests to conduct nonhazardous military activities: Blackwater River State Forest and Tate's Hell State Forest.

Enclosed with this letter is a draft copy of the *Programmatic Agreement (PA) Among Eglin Air Force Base and The Florida State Historic Preservation Officer Regarding The Proposed Gulf Regional Airspace Strategic Landscape Initiative*, for your review and recommendations, as set forth in the *Memorandum of Understanding between Eglin AFB, Florida and the Thlopthlocco Tribal Town for Consultation and Cooperation Pursuant to Section 106 of the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act*.

We look forward to any comments you may have concerning the draft PA. Eglin would like to receive your comments within 45 days of receiving this letter to meet our comment period schedule. Please let us know if you require additional review time. We will also contact you by phone in order to ensure your receipt of this report.

Eglin is again pleased to work with the Thlopthlocco Tribal Town in protecting the cultural resources of the Base and the state of Florida. Should you have any questions regarding the PA, please contact my representative Lynn Shreve at 850-883-5201.

Sincerely


For: MARIA D. RODRIGUEZ, GS-14
Chief, Environmental Management Branch

Attachment:

1. Draft *Programmatic Agreement Among Eglin Air Force Base The Florida State Historic Preservation Officer And The Florida Forest Service Regarding The Proposed Gulf Regional Airspace Strategic Landscape Initiative*

C.2 COASTAL ZONE CONSISTENCY ACT (CZMA) DETERMINATION

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION

Introduction

This document provides the State of Florida with the U.S. Air Force's Consistency Determination under CZMA Section 307 and 15 C.F.R. Part 930 sub-part C. The information in this Consistency Determination is provided pursuant to 15 C.F.R. Section 930.39 and Section 307 of the Coastal Zone Management Act, 16 U.S.C. § 1456, as amended, and its implementing regulations at 15 C.F.R. Part 930.

This federal consistency determination addresses the Gulf Regional Airspace Strategic Initiative (GRASI) Landscape Initiative (LI) Environmental Impact Statement (EIS) to utilize Blackwater River State Forest (BRSF) and Tate's Hell State Forest (THSF) for nonhazardous operations to include: helicopter landing and drop zones, airstrips, and associated land, water, and air training activities (operations currently occurring on Eglin Air Force Base [AFB]). The Air Force is also proposing to establish radar, telemetry and training emitter sites throughout northwest Florida.

Proposed Federal agency action:

The Proposed Action consists of two main components: establishment and use of training emitter sites and use of northwest Florida state forests for nonhazardous training activities. The purpose of the Air Force's Proposed Action is to afford military operational flexibility by providing optional training space for nonhazardous training should hazardous activity preclude use of the Eglin AFB Range.

The first component of the Proposed Action is for the placement of up to 12 radar, telemetry, and training emitter sites throughout northwest Florida to support development of a simulated integrated air defense system (IADS) to be used for air training (refer to Section 2.3.1 of the EIS). The majority of sites are associated with Florida Forest Service (FFS) watch towers, while two sites are owned by Florida Fish and Wildlife Conservation Commission (FWC) and one site by Eglin AFB. All sites are either "improved" or "semi-improved"; the area for each site would be approximately 0.5 acres. Training emitter sites identified would utilize FFS and FWC lands via leasing agreements. These sites would accommodate mobile and temporary use; mobile use means that the site would be used for a day with operators on-site, while temporary use may last for several days.

Training activities associated with the Proposed Action consist of helicopter landing and drop zones, airstrips, and a number of different land and air training activities; these activities currently occur on the Eglin AFB Range. Existing cleared areas within the state forests would be utilized as landing sites for helicopters and drop zones (DZs) for personnel and equipment from various aircraft (either fixed or rotary wing). Road improvements may be made to establish airstrips; however, these activities would occur in coordination with the FFS and follow FFS requirements. Landing and drop activities would also occur as part of the training activities. Helicopter landing zones (HLZs) are cleared areas that vary in size depending on the number and type of aircraft being used; a single CV-22 (Osprey) would need about an acre, while two CH-47s would need about 2.75 acres. Initially, training would occur perhaps only a few times

annually and as the GRASI Landscape Initiative program becomes more established training activities would increase over time, potentially occurring at frequencies described in the individual activity tables in Sections 2.3.2.1 through 2.3.2.2 of the EIS.

As part of the Proposed Action, Eglin AFB would establish a Landscape Implementation Team (LIT) and a GRASI Landscape Initiative Liaison to coordinate with the FFS in the following capacities:

- Developing real property leases/agreements
- Developing and implementing a methodology for scheduling training activities
- Identifying and implementing funding/reimbursement mechanisms to pay for leases/agreements
- Identifying specific operating requirements (e.g., number and sizes of HLZs/DZs needed for a particular year)
- Addressing each training site as an extension of the Eglin Range in terms of updating and revising training directives and safety requirements
- Developing addendums/attachments to Eglin Air Force Base Instruction (EAFBI) 13-212 Chapter 7 for BRSF and THSF to identify environmental considerations detailed in the EIS
- Ensuring compliance with EAFBI 13-212 Chapter 7, and appropriate environmental requirements

All mitigations and requirements identified in the EIS and the associated Mitigation Plan would be incorporated into an operating agreement with the FFS. For all training activities, operators must adhere to respective state forest management plan requirements. Such requirements include contacting the respective forest dispatch to identify campground activity for avoidance of inhabited recreational areas. In addition, no substantive land disturbance (e.g., land clearing, construction, digging of pits) would be allowed, and personnel must collect all waste/used expendables. These requirements are further detailed in Chapters 2 and 3 of the EIS. Road improvements may be made to establish airstrips; however, these activities would occur in coordination with the FFS and follow FFS requirements.

Federal Consistency Review

Statutes addressed as part of the Florida Coastal Zone Management Program consistency review and considered in the analysis of the Proposed Action are discussed in the following table.

Pursuant to 15 C.F.R. § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 C.F.R. § 930.41(b). Florida's concurrence will be presumed if Eglin AFB does not receive its response on the 60th day from receipt of this determination.

Florida Coastal Management Program Consistency Review

Statute	Consistency	Scope
Chapter 161 <i>Beach and Shore Preservation</i>	<p>The Proposed Action would not affect beach and shore management, specifically as it pertains to:</p> <ul style="list-style-type: none"> • The Coastal Construction Permit Program • The Coastal Construction Control Line (CCCL) Permit Program <p>Amphibious operations would occur under the Proposed Action. For operations in BRSF, to the extent possible operations would use established, hardened boat ramps for ingress/egress of amphibious craft. If ingress/egress must utilize natural habitat in wetlands, care would be taken to prevent destruction of wetland vegetation or other activities that might cause shoreline erosion. Ingress/egress points at nonhardened locations for both personnel and watercraft would be rotated to allow sites time to recover from amphibious operations.</p> <p>Amphibious operations in THSF would only be conducted at established boat landing sites along the shoreline of Apalachicola Bay. General Operational Constraints identified in Section 2.5 of the EIS would be implemented to minimize potential adverse impacts.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the protection of coastal areas.</p>	<p>This statute provides policy for the regulation of construction, reconstruction, and other physical activities related to the beaches and shores of the state. Additionally, this statute requires the restoration and maintenance of critically eroding beaches.</p>
Chapter 163, Part II <i>Growth Policy, County and Municipal Planning: Land Development Regulation</i>	<p>Local government agencies will be provided the opportunity to review and comment on the GRASI Landscape Initiative EIS. This review would ensure that the Proposed Action would be consistent with local government comprehensive plans.</p>	<p>Provide for the implementation of comprehensive planning programs to guide and control future development of the state.</p>
Chapter 186 <i>State and Regional Planning</i>	<p>State and regional agencies will be provided the opportunity to review and comment on the GRASI Landscape Initiative EIS. This review would ensure that the Proposed Action would be consistent with the state comprehensive plan.</p>	<p>Provides direction for the delivery of governmental services, a means for defining and achieving the specific goals of the state, and a method for evaluating the accomplishment of those goals in regards to the state comprehensive plan.</p>

Chapter 252 <i>Emergency Management</i>	<p>There is the potential for increased wildfire occurrences associated with training activities. While the potential for increased wildfire occurrence probability cannot be completely avoided under implementation of the Proposed Action, the constraints identified in Section 2.5 of the EIS would serve to minimize the potential for wildfire probability and provide mechanisms for adequate wildfire response.</p> <p>The Proposed Action would be consistent with Florida's statutes and regulations regarding the state's vulnerability to natural disasters and disaster response procedures.</p>	Directs the state to reduce the vulnerability of its people and property to natural and manmade disasters; prepare for, respond to and reduce the impacts of disasters; and decrease the time and resources needed to recover from disasters.
Chapter 253 <i>State Lands</i>	<p>Overall, the Air Force has not identified any changes to land use designations or significant land use conflicts, and no significant adverse impacts to land use associated with training activities have been identified.</p> <p>Operational constraints identified in Section 2.5 of the EIS would be incorporated into an operating agreement with the FFS; measures would be taken to avoid conflicts with the public and minimize any potential impacts from restricted access.</p> <p>The Proposed Action would be consistent with Florida's statutes and regulations regarding the acquisition, administration, management, control, supervision, conservation, protection, and disposition of public lands.</p>	Addresses the acquisition, administration, management, control, supervision, conservation, protection, and disposition of all state lands.
Chapter 258 <i>State Parks and Preserves</i>	<p>The Proposed Action would adhere to respective State Forest Management Plan and Aquatic Preserve Management Plan requirements.</p> <p>The training activities under the Proposed Action would not result in significant adverse impacts to recreation at BRSF or THSF. As described in Section 2.5 of the EIS, scheduling for training activities would constrain the time, frequency, and types of activities to avoid conflicts with hunters, campers, boaters, and other recreational users. Some transient recreational users, such as hikers, may be disturbed by noise from aircraft operations.</p> <p>Operational constraints identified in Section 2.5 of the EIS would be</p>	Addresses the state's administration of state parks, aquatic preserves, and recreation areas.

	<p>incorporated into an operating agreement with the FFS; measures would be taken to avoid conflicts with the public and minimize any potential impacts from restricted access.</p> <p>The Proposed Action would be consistent with Florida's statutes and regulations regarding the management of state parks, aquatic preserves and recreational areas.</p>	
<p>Chapter 259 <i>Land Acquisitions for Conservation or Recreation</i></p>	<p>The major recreation areas at BRSF include Bear Lake Recreation Area, Bone Creek Recreational Area, Camp Paquette, Coldwater Recreation Area, Hurricane Lake Recreation Area, Karick Lake Recreation Area, and the Krul Recreation Area. These recreation areas provide opportunities for camping swimming, picnicking, hiking, canoeing, fishing, horseback riding, and mountain biking as well as other activities permitted in Florida state forests. BRSF also contains three separate Wildlife Management Areas (WMAs) including the Blackwater WMA, the Blackwater Carr Unit, and the Blackwater Hutton Unit. These WMAs provide opportunities for hunting, horseback riding, wildlife viewing, cycling, canoeing, and fishing.</p> <p>The entire THSF is part of an approximately 200,000-acre WMA that provides opportunities for recreational activities, including horseback riding (where permitted), camping (where permitted), fishing, wildlife viewing, biking, picnicking, off-highway vehicle use, and canoeing.</p> <p>Temporary disturbance to transient recreational users from noise during training activities is possible. Impacts to other recreational users and adjacent landowners would be minimized through implementation of operational constraints identified in Section 2.5 of the EIS, and avoidance of noise-sensitive areas. Minor, short-term small-scale closures of areas (HLZs/DZs, road segments) during training activities represent less than one-half of one percent of the total areas for the forests. These short-term closures would not preclude use of the forest and access would be allowed once training activities cease.</p> <p>At BRSF, the Short-Term Offender</p>	<p>Addresses public ownership of natural areas for purposes of maintaining the state's unique natural resources; protecting air, land, and water quality; promoting water resource development to meet the needs of natural systems and citizens of this state; promoting restoration activities on public lands; and providing lands for natural resource based recreation.</p>

	<p>Program (STOP) Camp and Santa Rosa Youth Academy (SRYA) sites are currently not open to the public, and this would not change if the Air Force utilizes these locations. No conflicts with hunters have been identified since day-time training activities would be restricted during hunting season. While the quality of the recreational experience may be somewhat diminished by these impacts, this would not preclude recreational use or cause general incompatibility, and impacts would be short term.</p> <p>Operational constraints identified in Section 2.5 of the EIS would be incorporated into an operating agreement with the FFS; measures would be taken to avoid conflicts with the public and minimize any potential impacts from restricted access.</p> <p>The Proposed Action would be consistent with Florida's statutes and regulations regarding the management of conservation and recreation state lands.</p>	
Chapter 260 <i>Florida Greenways and Trails Act</i>	<p>Blackwater River State Forest is part of the Florida National Scenic Trail. The Air Force would provide appropriate access points and proper signage to provide safe crossings for recreational trail users during training activities.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the Greenways and Trails Program.</p>	Statewide system of greenways and trails established in order to conserve, develop, and use the natural resources of Florida for healthful and recreational purposes.
Chapter 267 <i>Historical Resources</i>	<p>Emitter site establishment and use are unlikely to impact cultural resources. Sites have been previously developed with adequate infrastructure in place.</p> <p>Approximately 1,185 acres have been surveyed within BRSF. There are 196 known archaeological sites ranging in age from twentieth century historic contexts to the Paleo-Indian period; most of the 196 sites have not been evaluated for eligibility on the National Register of Historic Places (NRHP). Two historic cemeteries have been identified on BRSF and one NRHP eligible historic structure is located within the boundaries of BRSF.</p> <p>Approximately 3,780 acres have been surveyed within THSF. There are 35 known</p>	Addresses the management and preservation of the state's archaeological and historical resources.

	<p>archaeological sites ranging in age from twentieth century historic contexts to the Early Archaic period; most of the 35 sites have not been evaluated for eligibility on the NRHP. One historic district, Camp Gordon Johnson, formerly occupied the eastern half of THSF and one historic cemetery has been identified in Tactical Area (TA)-3. Appendix F of the EIS lists sites considered potentially eligible along with those that remain unevaluated.</p> <p>Potential adverse impacts to cultural resources may occur from land disturbance activities, dismounted movement, and amphibious operations due to ground disturbance. Impacts mainly consist of potential disturbance or inadvertent discovery of previously unidentified cultural resources in both surveyed and unsurveyed areas. Ground disturbing activities will not occur in unsurveyed areas, and known cultural resource locations would be avoided as part of general operational constraints (see Section 2.5 of the EIS).</p> <p>The Air Force will conduct National Historic Preservation Act (NHPA) Section 106 consultation with the Advisory Council on Historic Preservation (ACHP), Florida State Historic Preservation Office (SHPO), and applicable Native American tribes for this Proposed Action. Any resulting mitigations from the Section 106 Consultation would be followed.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the state's archaeological and historical resources.</p>	
<p>Chapter 288 <i>Commercial Development and Capital Improvements</i></p>	<p>Overall, tourism and outdoor recreational activities such as picnicking, camping, boating, fishing, and hunting would not be adversely affected by the use of BRSF or THSF for training activities. Implementation of the Proposed Action would not prevent these activities from occurring in the same capacity as the baseline condition.</p> <p>Operational constraints identified in Section 2.5 of the EIS would be incorporated into an operating agreement with the FFS; measures would be taken to avoid conflicts with the public and</p>	<p>Promotes and develops general business, trade, and tourism components of the state economy</p>

	<p>minimize any potential impacts from restricted access.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding future business opportunities on state lands, or the promotion of tourism in the region.</p>	
Chapter 334 <i>Transportation Administration</i>	The Proposed Action would not affect transportation.	Addresses the state's policy concerning transportation administration.
Chapter 339 <i>Transportation Finance and Planning</i>	The Proposed Action would not affect the finance and planning needs of the state's transportation system.	Addresses the finance and planning needs of the state's transportation system.
Chapter 373 <i>Water Resources</i>	<p>Emitter site establishment and use would not be expected to result in impacts to water resources.</p> <p>Water resources at BRSF include the watersheds of the Blackwater River and its tributaries, a portion of the Yellow River watershed and its tributaries, the sand and gravel and Floridan aquifers, and areas of wetlands and floodplains associated with the Blackwater River, Yellow River and their tributaries. There are 27,222 acres of wetlands at BRSF, including nearly 26,414 acres of palustrine or freshwater wetlands, 495 acres of lacustrine wetlands, and 313 acres of riverine wetlands.</p> <p>Water resources at THSF include the watersheds of Ochlockonee River, New River and Whiskey George Creek (part of the Apalachicola River basin), the Floridan aquifer, and extensive areas of wetlands and floodplains throughout the area. There are 181,476 acres of wetlands at THSF, including nearly 179,949 acres of palustrine or freshwater wetlands, 1,300 acres of estuarine wetlands, 44 acres of lacustrine wetlands, and 183 acres of riverine wetlands.</p> <p>There are potential impacts to water resources from incidental surface disturbances associated with land disturbance activities, ground movements, bivouac, vehicle stream crossings, and amphibious operations. However, impacts would be minimized through implementation of General Operational Constraints identified in Section 2.5 of the EIS. These include:</p>	Addresses sustainable water management; the conservation of surface and ground waters for full beneficial use; the preservation of natural resources, fish, and wildlife; protecting public land; and promoting the health and general welfare of Floridians.

	<ul style="list-style-type: none"> • Water resource protection would include a 100-foot buffer zone around all surface water bodies (streams, ponds, and lakes), wetlands and floodplains. • Wheeled vehicle use would be restricted to existing, approved roads and trails in each Tactical Area. • Concentrated troop movements would not be allowed on steep slopes, streambanks/shorelines and wetlands. <p>With the exception of minor land improvement activities on unpaved road segments for airstrip establishment no land development activities have been proposed. Eglin Water Resources Office would coordinate all applicable permits in accordance with the Florida Administrative Code (FAC) prior to minor land improvement activities as necessary.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the water resources of the state.</p>	
Chapter 375 <i>Outdoor Recreation and Conservation Lands</i>	<p>Overall, outdoor recreational activities such as picnicking, camping, boating, fishing, and hunting would not be adversely affected by the use of BRSF or THSF for training activities. Implementation of the Proposed Action would not prevent these activities from occurring in the same capacity as the baseline condition. The Air Force will coordinate with the FFS to identify time and area constraints for training activities (e.g., avoidance of specific hunting seasons and associated areas) and incorporate these constraints into unit training plans.</p> <p>Operational constraints identified in Section 2.5 of the EIS would be incorporated into an operating agreement with the FFS; measures would be taken to avoid conflicts with the public and minimize any potential impacts from restricted access.</p> <p>The Proposed Action would be consistent with Florida's statutes and regulations regarding recreation on state lands.</p>	Addresses the development of a comprehensive multipurpose outdoor recreation plan, with the purpose to document recreational supply and demand, describe current recreational opportunities, estimate the need for additional recreational opportunities, and propose the means to meet the identified needs.
Chapter 376 <i>Pollutant Discharge</i>	Training areas would be inspected after operations have ceased to ensure that no	Regulates transfer, storage, and transportation of pollutants, and

<i>Prevention and Removal</i>	<p>trash, ammunition boxes, wire, or other debris is left in the area.</p> <p>Forward Air Refueling Point/Hot Gas Operations (FARP/HGO) activities may only occur on hardened surfaces (e.g., concrete or asphalt), and are not likely to occur in the forests. Although spills and leaks could occur, it is anticipated that spills during refueling would be rare, since refueling is conducted under strenuous process protocols for safety and accident prevention. Best practices to prevent and rapidly respond to spills, as outlined in the Eglin Air Force Base Oil and Hazardous Substance Contingency Plan, would be implemented during refueling to prevent accidents and reduce impacts. All spills and accidental discharges of petroleum, oils, lubricants, chemicals, hazardous waste or hazardous materials, regardless of the quantity, would be reported through the GRASLI Liason and Eglin AFB within 4 duty hours of the spill occurrence.</p> <p>Potential impacts from the use of pyrotechnics and non-lethal munitions would be minimized by the implementation of General Operational Constraints identified in Section 2.5 of the EIS.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the transfer, storage, transportation of pollutants, and cleanup of pollutant discharges.</p>	cleanup of pollutant discharges.
<i>Chapter 377 Energy Resources</i>	The Proposed Action would not affect energy resource production, including oil and gas, and/or the transportation of oil and gas.	Addresses regulation, planning, and development of the energy resources of the state; provides policy to conserve and control the oil and gas resources in the state.
<i>Chapter 379 Fish and Wildlife Conservation</i>	<p>Emitter site establishment and use would not be expected to result in impacts to biological resources, because sensitive habitats and protected species would be avoided. The small footprint (approximately 0.5 acres) of the emitter equipment and the use of improved and semi-improved areas would not damage native vegetation or displace wildlife.</p> <p>For BRSF and THSF, training activities would be restricted within known sensitive species habitat. There are potential impacts to biological resources from incidental</p>	Establishes the framework for the management and protection of the state of Florida's wide diversity of fish and wildlife resources.

	<p>disturbances associated with dismounted maneuvers, vehicle stream crossings, aircraft noise, and amphibious operations. These impacts would be of minor intensity and short-term in duration. Impacts have also been identified associated with increased wildfire potential resulting from training activities. The intensity of potential impacts is minimized through implementation of General Operational Constraints identified in Section 2.5 of the EIS.</p> <p>As a result of potential impacts to protected species, Eglin Natural Resources has prepared an Endangered Species Act (ESA) Section 7 consultation for the U.S. Fish and Wildlife Service (USFWS). All requirements resulting from this consultation will be followed.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding the protection of fish and wildlife resources of the state.</p>	
<p>Chapter 380 <i>Land and Water Management</i></p>	<p>Under the Proposed Action, development of state lands with regional impacts would not occur. No changes to coastal infrastructure such as capacity increases of existing coastal infrastructure, or use of state funds for infrastructure planning, designing or construction would occur.</p>	<p>Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.</p>
<p>Chapter 381 <i>Public Health, General Provisions</i></p>	<p>The Proposed Action would not affect the state's policy concerning the public health system.</p>	<p>Establishes public policy concerning the state's public health system.</p>
<p>Chapter 388 <i>Mosquito Control</i></p>	<p>The Proposed Action would not affect mosquito control efforts.</p>	<p>Addresses mosquito control efforts in the state.</p>
<p>Chapter 403 <i>Environmental Control</i></p>	<p>Training activities would result in small amounts of air emissions, the majority of which would not result in adverse impacts at either state forest.</p> <p>There are potential impacts to water resources from incidental surface disturbances associated with ground movement, bivouac, vehicle stream crossings, and amphibious operations. However, impacts would be minimized through implementation of General Operational Constraints identified in Sections 2.5 of the EIS. The Eglin Water Resources Office would coordinate all applicable permits in accordance with the</p>	<p>Establishes public policy concerning environmental control in the state.</p>

	<p>Florida Administrative Code (FAC) prior to land improvement activities as necessary.</p> <p>Training areas would be inspected after operations have ceased to ensure that no trash, ammunition boxes, wire, or other debris is left in the area. Potential impacts from the use of pyrotechnics and non-lethal munitions would be minimized by the implementation of General Operational Constraints identified in Section 2.5 of the EIS.</p> <p>Therefore, the Proposed Action would be consistent with the State's policies concerning air quality, water quality, pollution control, solid waste management, and other environmental control efforts.</p>	
<p>Chapter 553 <i>Building and Construction Standards</i></p>	<p>The Proposed Action would not include construction of buildings.</p>	<p>Addresses building construction standards and provides for a unified Florida Building Code.</p>
<p>Chapter 582 <i>Soil and Water Conservation</i></p>	<p>Emitter site establishment and use would not be expected to negatively affect any soils because all sites are either "improved" or "semi-improved." Most sites would require few, if any, minor improvements to support the emitters.</p> <p>Land improvement activities would be limited to minor improvement of small road segments (four segments in BRSF, three segments in THSF) for airstrip use and would be limited to existing road beds.</p> <p>Clear zones for airfields would be cleared as part of normal forestry operations; the Air Force would not clear any areas in support of airstrip establishment. Airstrips within poorly suited areas (see Section 3.6.3 of the EIS) can only be established on existing roadways that do not require land disturbance outside the existing road bed or right-of-way. This limits the potential for adverse impacts associated with soil erosion.</p> <p>There are potential impacts to soils resulting from airstrip establishment and use, HLZ/DZ use, ground movement, bivouac, vehicle stream crossings, and amphibious operations. The extent of these impacts is minimized through implementation of General Operational Constraints identified in Section 2.5 of the EIS.</p>	<p>Provides policy regarding the control and prevention of soil erosion.</p>

	Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding soil and water conservation efforts.	
Chapter 597 <i>Aquaculture</i>	<p>For amphibious operations in the streams and rivers of BRSF and THSF, to the extent possible operations would use established, hardened boat ramps for ingress/egress of amphibious craft. If ingress/egress must utilize natural habitat in wetlands, care would be taken to prevent destruction of wetland vegetation or other activities that might cause shoreline erosion. Ingress/egress points at nonhardened locations for both personnel and watercraft would be rotated to the extent possible to allow sites time to recover from amphibious operations.</p> <p>Apalachicola Bay is a State Aquatic Preserve with designated uses such as shellfish propagation and harvesting. Therefore, amphibious operations along the shoreline of Apalachicola Bay in THSF would only be conducted at established boat landing sites.</p> <p>Therefore, the Proposed Action would be consistent with Florida's statutes and regulations regarding state aquaculture and conservation of aquatic resources.</p>	Establishes public policy concerning the cultivation of aquatic organisms of the state. Addresses state aquaculture plan which provides for the coordination and prioritization of state aquaculture efforts, the conservation and enhancement of aquatic resources and provides mechanisms for increasing aquaculture production.

C.3 BIOLOGICAL ASSESSMENT

The Air Force conducted ESA Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) for this Proposed Action; the Air Force has made a determination that the action may affect but is not likely to adversely affect endangered species and has received concurrence from the USFWS. A copy of the Biological Assessment is included in this appendix.



**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 96TH TEST WING (AFMC)
EGLIN AIR FORCE BASE FLORIDA**

Mr. Thomas L. Chavers
Chief, Eglin Natural Resources
501 De Leon Street, Suite 101
Eglin AFB FL 32542-5133

JAN 22 2014

Dr. Donald Imm
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City FL 32405

Dear Dr. Imm:

The attached Informal Biological Assessment is being submitted to fulfill requirements under Section 7 of the Endangered Species Act (ESA). This Biological Assessment analyzes potential impacts to the red-cockaded woodpecker (RCW), wood stork, reticulated flatwoods salamander and critical habitat, frosted flatwoods salamander and critical habitat, eastern indigo snake, Gulf sturgeon and critical habitat, piping plover and critical habitat, purple bankclimber and critical habitat, Choctaw bean and critical habitat, narrow pigtoe and critical habitat, southern sandshell and critical habitat, fuzzy pigtoe and critical habitat, Godfrey's butterwort, Florida skullcap, white birds-in-a-nest, and telephus spurge. This consultation also considers the gopher tortoise, bald eagle, several federally petitioned species, and multiple state-listed species.

The Proposed Action identified in the Gulf Regional Airspace Strategic Initiative (GRASI) Landscape Initiative (GLI) Environmental Impact Statement (EIS) is for the Air Force to conduct nonhazardous training activities on Blackwater River State Forest (BRSF) and Tate's Hell State Forest (THSF) and to use of emitter sites at various remote locations in northwest Florida. Training activities would involve some minor land disturbance (no land development), use of wheeled vehicles on established roads only, cross-country troop movements, bivouacking, helicopter and light aviation landings on established landing zones (existing roads and cleared areas), amphibious operations, and use of blank ammunition and pyrotechnics in select areas. Use of the forests would be accomplished through lease agreements with the Florida Forest Service (FFS).

Based on analysis of potential direct physical impacts, noise, and habitat impacts associated with the Proposed Action, GLI activities may affect, but are not likely to adversely affect the federally protected species listed above. Implementation of the conservation measures listed in Section 2.3 of the Biological Assessment will minimize the potential for negative impacts to protected species from GLI activities.

Due to the complex nature of this Proposed Action, Eglin would be happy to provide a briefing of the proposed activities and the process by which Eglin plans to ensure conservation measures are implemented for the action. If you have any questions regarding this Biological Assessment or any of the proposed activities, please do not hesitate to contact either Mr. Jeremy Preston (850)-883-1153, Mr. Bruce Hagedorn (850) 882-8421, or myself at (850) 882-0143.

Sincerely,

A handwritten signature in black ink, reading "Thomas L. Chavers". The signature is fluid and cursive, with the first name "Thomas" being more prominent than the last name "Chavers".

THOMAS L. CHAVERS, GS-13

Attachment:

Informal Biological Assessment for the Gulf Regional Airspace Strategic Initiative (GRASI) Landscape Initiative Training Areas



IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Field Office
1601 Balboa Avenue
Panama City, FL 32405-3721

Tel: (850) 769-0552
Fax: (850) 763-2177

FILE

April 8, 2014

Mr. Thomas L. Chavers
Chief, Eglin Natural Resources
501 De Leon Street, Suite 101
Eglin AFB, FL 32542-5133

Re: USFWS #04EF3000-2014-I-0107
Date Started: February 10, 2014
Action Agency: Eglin Air Force Base
Project Title: Gulf Regional Airspace Strategic
Initiative (GRASI) Landscape Initiative Training
Areas
Location: Eglin Air Force Base
Ecosystem: Northeast Gulf
Counties: Santa Rosa, Okaloosa, Walton, and
Franklin, Florida

Dear Mr. Chavers:

This letter acknowledges the U. S. Fish & Wildlife Service's (Service) receipt of your letter dated January 22, 2014, and biological assessment (BA) dated January 2014, requesting informal consultation in accordance with Section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.) and the Sikes Act of 1960, as amended (16 U.S.C. 670a et seq). We received your letter and BO on February 10, 2014 relative to impacts with the Gulf Regional Airspace Strategic Initiative (GRASI) Landscape Initiative (GLI) actions.

The Proposed Action identified in the GRI Environmental Impact Statement is for the Air Force to conduct nonhazardous training activities on Blackwater River State Forest (BRSF) and Tate's Hell State Forest (THSF) and to use emitter sites as various remote locations in northwest Florida. Training activities would involve some minor land disturbance (no land development), use of wheeled vehicles on established roads only, cross-country troop movements, bivouacking, helicopter and light aviation landings on established landing zones (existing roads and cleared areas), amphibious operations, and use of blank ammunition and pyrotechnics in select areas. Use of the forests would be accomplished through lease agreements with the Florida Forest Service.

The GLI is a United States Air Force-led partnership with the State of Florida and other state and federal agencies to improve the flexibility of the region to safely host military test and training

Mr. Chavers

2

operations. The Proposed Action is needed because there is a projected regional shortfall of military training and testing land and airspace in the GRASI region. This action would improve scheduling flexibility and reduce competing demands on restricted areas.

Based on incorporation of Conservation Measures into the project plans, Eglin's AFB's Natural Resource Section's (NRS) determination of effects to the protected species and the Service's responses per action are summarized within Table 1 below.

Species	Scientific Name	Location	Action			NRS Effects Determination - individuals/ critical habitat	FWS Response
			Direct Physical Impact	Harassment	Habitat Impact		
Red-cockaded Woodpecker	<i>Picoides borealis</i>	BRSF	No effect	X	X	Not likely to adversely affect	Concur
		THSF	No effect	X	X		
Wood Stork	<i>Mycteria americana</i>	THSF	No effect	X	X	Not likely to adversely affect	Concur
Reticulated flatwoods salamander*	<i>Ambystoma bishopi</i>	BRSF	X	No effect	X	Not likely to adversely affect/ modify habitat	Concur
Frosted flatwoods salamander*	<i>Ambystoma cingulatum</i>	THSF	X	No effect	X	Not likely to adversely affect/ modify habitat	Concur
Eastern indigo snake	<i>Drymarchon couperi</i>	BRSF	X	X	X	Not likely to adversely affect	Concur
		THSF	X	X	X		
Piping plover*	<i>Charadrius melodus</i>	THSF	X	X	No effect	Not likely to adversely affect/ no effect	Concur
Gulf sturgeon*	<i>Acipenser oxyrinchus desotoi</i>	BRSF	X	X	X	Not likely to adversely affect/ modify habitat	Concur
		THSF	X	X	X		
Purple bankclimber *	<i>Elliptioideus sloatianus</i>	THSF	No effect	No effect	X	Not likely to adversely affect/ modify habitat	Concur

Mr. Chavers

3

Chactaw bean*	<i>Villosa choctawensis</i>	BRSF	No effect	No effect	X	Not likely to adversely affect/ modify habitat	Concur
Narrow pigtoe*	<i>Fusconaia escambia</i>	BRSF	No effect	No effect	X	Not likely to adversely affect/ modify habitat	Concur
Southern sandshell*	<i>Hamiota australis</i>	BRSF	No effect	No effect	X	Not likely to adversely affect/ modify habitat	Concur
Fuzzy pigtoe*	<i>Pleurobema strodeanum</i>	BRSF	No effect	No effect	X	Not likely to adversely affect/ modify habitat	Concur
Godfrey's butterwort	<i>Pinguicula ionantha</i>	THSF	X	No effect	X	Not likely to adversely affect	Concur
Florida skullcap	<i>Scutellaria floridana</i>	THSF	X	No effect	X	Not likely to adversely affect	Concur
White birds-in-a-nest	<i>Macbridea alba</i>	THSF	X	No effect	X	Not likely to adversely affect	Concur
Telephus spurge	<i>Euphorbia telephioides</i>	THSF	X	No effect	X	Not likely to adversely affect	Concur

*Critical habitat for this species is also present on or adjacent to the state forests.

In summary, we concur with the BA's determination of not likely to adversely affect individuals and for no effect or not likely to adversely modify critical habitat. We have assigned log number USFWS #04EF3000-2014-I-0107 to this informal consultation.

The Service does have two recommendations that we would like to have incorporated within the GRASI LSI operational plan to address conservation of federal species of concern Westfall's clubtail, *Gomphus westfalli*, and low water crossings. Westfall's clubtail is a northwest Florida endemic dragonfly that utilizes spring and boggy streams for part of its life cycle and is only known from a few locations, including the Blackwater fish hatchery. Due to this, the Service is requesting a two mile radial buffer around the fish hatchery where no low water crossings will be used and no water related training will occur. The BA identified 244 possible low water crossings (Poor = 83, Fair = 125, and Good = 36) that could be used for military training. To minimize potential impacts from training, we recommend that both the good and the poor rated

Mr. Chavers

4

low water crossings be removed from training use in an effort to protect the best and to prevent further degradation of the poor sites.

Thank you for providing us with the opportunity to comment on this project. Please contact Lisa Lehnhoff of this office at extension 225 for additional information and coordination.

Sincerely,

A handwritten signature in dark ink, appearing to read "Donald W. Imm". The signature is fluid and cursive, with a long horizontal stroke at the end.

Dr. Donald W. Imm
Project Leader

Mr. Chavers

5

Location: S:\Staff\Lisa\Military Bases

**EGLIN AIR FORCE BASE
Florida**

U.S. FISH AND WILDLIFE SERVICE

FINAL

**INFORMAL ENDANGERED SPECIES ACT
SECTION 7 CONSULTATION FOR THE
GULF REGIONAL AIRSPACE STRATEGIC
INITIATIVE (GRASI) LANDSCAPE INITIATIVE
TRAINING AREAS**

EGLIN AFB, FL



JANUARY 2014



PRINTED ON RECYCLED PAPER

TABLE OF CONTENTS

	<u>Page</u>
List of Tables.....	iii
List of Figures.....	iii
List of Acronyms, Abbreviations, and Symbols.....	iv
 1. INTRODUCTION.....	 1-1
2. DESCRIPTION OF PROPOSED ACTION.....	2-1
2.1 Proposed Action.....	2-1
2.2 Scope of the Proposed Action.....	2-1
2.2.1 Emitter Sites.....	2-1
2.2.2 Training Activities in Northwest Florida State Forests.....	2-1
2.3 Conservation Measures.....	2-7
3. BIOLOGICAL INFORMATION.....	3-1
3.1 Federally Listed Species.....	3-4
3.1.1 Red-cockaded Woodpecker.....	3-4
3.1.2 Wood Stork.....	3-6
3.1.3 Reticulated Flatwoods Salamander and Critical Habitat.....	3-6
3.1.4 Frosted Flatwoods Salamander and Critical Habitat.....	3-7
3.1.5 Eastern Indigo Snake.....	3-7
3.1.6 Gulf Sturgeon and Critical Habitat.....	3-8
3.1.7 Piping Plover and Critical Habitat.....	3-8
3.1.8 Purple Bankclimber and Critical Habitat.....	3-9
3.1.9 Choctaw Bean, Narrow Pigtoe, Southern Sandshell, Fuzzy Pigtoe and Critical Habitat.....	3-9
3.1.10 Godfrey's Butterwort.....	3-10
3.1.11 Florida Skullcap.....	3-11
3.1.12 White Birds-in-a-nest.....	3-12
3.1.13 Telephus Spurge.....	3-13
3.2 Other Species Considered.....	3-13
3.2.1 Gopher Tortoise.....	3-13
3.2.2 Federally Petitioned Species.....	3-14
3.2.3 Bald Eagle.....	3-16
3.2.4 State Listed Animal Species.....	3-16
3.2.5 State Listed Plant Species.....	3-19
4. EFFECTS DETERMINATION.....	4-1
4.1 Federally Listed Species.....	4-2
4.1.1 Red-cockaded Woodpecker.....	4-2
4.1.2 Wood Stork.....	4-6
4.1.3 Reticulated Flatwoods Salamander and Critical Habitat.....	4-6
4.1.4 Frosted Flatwoods Salamander and Critical Habitat.....	4-7
4.1.5 Eastern Indigo Snake.....	4-7
4.1.6 Gulf Sturgeon and Critical Habitat.....	4-8
4.1.7 Piping Plover and Critical Habitat.....	4-9
4.1.8 Purple Bankclimber and Critical Habitat.....	4-9
4.1.9 Choctaw Bean, Narrow Pigtoe, Southern Sandshell, Fuzzy Pigtoe and Critical Habitat.....	4-9
4.1.10 Godfrey's Butterwort.....	4-10
4.1.11 Florida Skullcap.....	4-10
4.1.12 White Birds-in-a-nest.....	4-11
4.1.13 Telephus Spurge.....	4-11
4.1.14 Conservation Measures.....	4-11
4.1.15 Summary of Potential Impacts.....	4-12
4.2 Other Species Considered.....	4-13

4.2.1	Gopher Tortoise.....	4-13
4.2.2	Federally Petitioned Animal Species.....	4-13
4.2.3	Federally Petitioned Plant Species.....	4-14
4.2.4	Bald Eagle	4-14
4.2.5	State-listed Animal Species	4-15
4.2.6	State-listed Plant Species.....	4-15
5.	CONCLUSION	5-1
6.	REFERENCES	1

LIST OF TABLES

	<u>Page</u>
Table 2-1. Summary of Emitter Types and Proposed Locations	2-2
Table 2-2. Expendables Usage Details	2-3
Table 2-3. Sensitive Species Protection Levels for GLI Ground Operations	2-10
Table 2-4. GRASI LI Training Activities Allowed/Not Allowed Within 200 ft of RCW Cavity Tree	2-12
Table 3-1. Federally Listed Species Within or Adjacent to the Proposed Action Areas	3-1
Table 3-2. Federally Petitioned Animal Species at THSF and BRSF	3-14
Table 3-3. Federally Petitioned Plant Species at BRSF and THSF	3-15
Table 3-4. State Listed Animal Species at BRSF and THSF	3-16
Table 3-5. State Listed Plant Species at BRSF and THSF	3-19
Table 4-1. Proposed Action Effectors	4-3
Table 4-2. Wildfire Specific Action Guide Restrictions on Eglin AFB	4-5
Table 4-3. Potential Impacts to Federally Listed Species at BRSF	4-12
Table 4-4. Potential Impacts to Federally Listed Species at THSF	4-12

LIST OF FIGURES

	<u>Page</u>
Figure 1-1. Location of Blackwater River and Tate's Hell State Forests, and Proposed Emitter Sites	1-2
Figure 1-2. Blackwater River State Forest Tactical Areas	1-3
Figure 1-3. Tate's Hell State Forest Tactical Areas	1-4
Figure 3-1. Federally Listed Species Within or Adjacent to BRSF	3-2
Figure 3-2. Federally Listed Species Within or Adjacent to THSF	3-3
Figure 3-3. Godfrey's Butterwort Documented Occurrences	3-11
Figure 3-4. Florida Skullcap Documented Occurrences	3-12
Figure 3-5. White Birds-in-a-Nest Documented Occurrences	3-12
Figure 3-6. Telephus Spurge Documented Occurrences	3-13

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

7SFG(A)	7 th Special Forces Group (Airborne)	RSOP	Range Standard Operating Procedure
ac	Acre	RCW	Red-cockaded woodpecker
AFB	Air Force Base	REA	Range Environmental Assessment
AFSOC	Air Force Special Operations Command	SRYA	Santa Rosa Youth Academy
AFI	Air Force Instruction	SSC	Species of Special Concern
AGL	Above ground level	STOP	Short-term Offender Program
ATV	All terrain vehicle	TA	Tactical Area
BA	Biological Assessment	THSF	Tate's Hell State Forest
BRSF	Blackwater River State Forest	TES	Threatened and Endangered Species
cm	Centimeters	U.S.	United States
DBH	Diameter at Breast Height	USF	University of South Florida
DoD	Department of Defense	USFWS	U.S. Fish and Wildlife Service
DPI	Direct physical impact		
DZ	Drop zone		
EAFB	Eglin Air Force Base		
EAFBI	Eglin Air Force Base Instruction		
EIS	Environmental Impact Statement		
EM	Environmental Management Directorate		
EMR	Electro-magnetic radiation		
ESA	Endangered Species Act		
FARP	Forward air refueling point		
FDACS	Florida Department of Agriculture & Consumer Services		
FFS	Florida Forest Service		
FL	Florida		
FNAI	Florida Natural Areas Inventory		
FS	Forestry Site		
ft	Foot or Feet		
FWC	Florida Fish and Wildlife Conservation Commission		
FY	Fiscal Year		
GBS	Ground burst simulator		
GIS	Geographic Information System		
GLI	GRASI Landscape Initiative		
GPS	Global Positioning System		
GRASI	Gulf Regional Airspace Strategic Initiative		
ha	Hectare		
H	Harassment		
Hb	Habitat impact		
HGO	Hot gas operation		
HLZ	Helicopter landing zone		
HMMWV	High mobility multi-purpose wheeled vehicle		
INRMP	Integrated Natural Resources Management Plan		
LI	Landscape Initiative		
LZ	Landing zone		
LOS	Line of sight		
LU-1	Limited Use-1		
LU-2	Limited Use-2		
MLLW	Mean lower low water		
NAS	National Audubon Society		
NI	no impact		
PEA	Programmatic Environmental Assessment		
PBG	Potential Breeding Group		
PIP	Propellant Initiation Program		
POL	Petroleum, oil, and lubricants		
PRCs	Primary Recruitment Clusters		

January 2014

Biological Assessment for GRASI Landscape Initiative Training Areas
Eglin Air Force Base, FL

Page iv

1. INTRODUCTION

This Biological Assessment (BA), developed by Eglin Air Force Base (AFB) Natural Resources, is meant to fulfill the requirements of the Endangered Species Act (ESA) for assessing potential impacts to federally listed species. This consultation addresses Department of Defense (DoD) nonhazardous training activities associated with the Gulf Regional Airspace Strategic Initiative (GRASI) Landscape Initiative (GLI) on Blackwater River State Forest (BRSF) and Tate's Hell State Forest (THSF) and the use of emitter sites at various remote locations in northwest Florida (Figure 1-1, Figure 1-2, and Figure 1-3). This BA assesses potential impacts from the use of these areas for the emitters and training activities on the federally listed red-cockaded woodpecker (RCW), wood stork, reticulated flatwoods salamander and critical habitat, frosted flatwoods salamander and critical habitat, eastern indigo snake, Gulf sturgeon and critical habitat, piping plover and critical habitat, purple bankclimber and critical habitat, Choctaw bean and critical habitat, narrow pigtoe and critical habitat, southern sandshell and critical habitat, fuzzy pigtoe and critical habitat, Godfrey's butterwort, Florida skullcap, white birds-in-a-nest, and telephus spurge. This consultation also considers the gopher tortoise, bald eagle, several federally petitioned species, and multiple state-listed species.

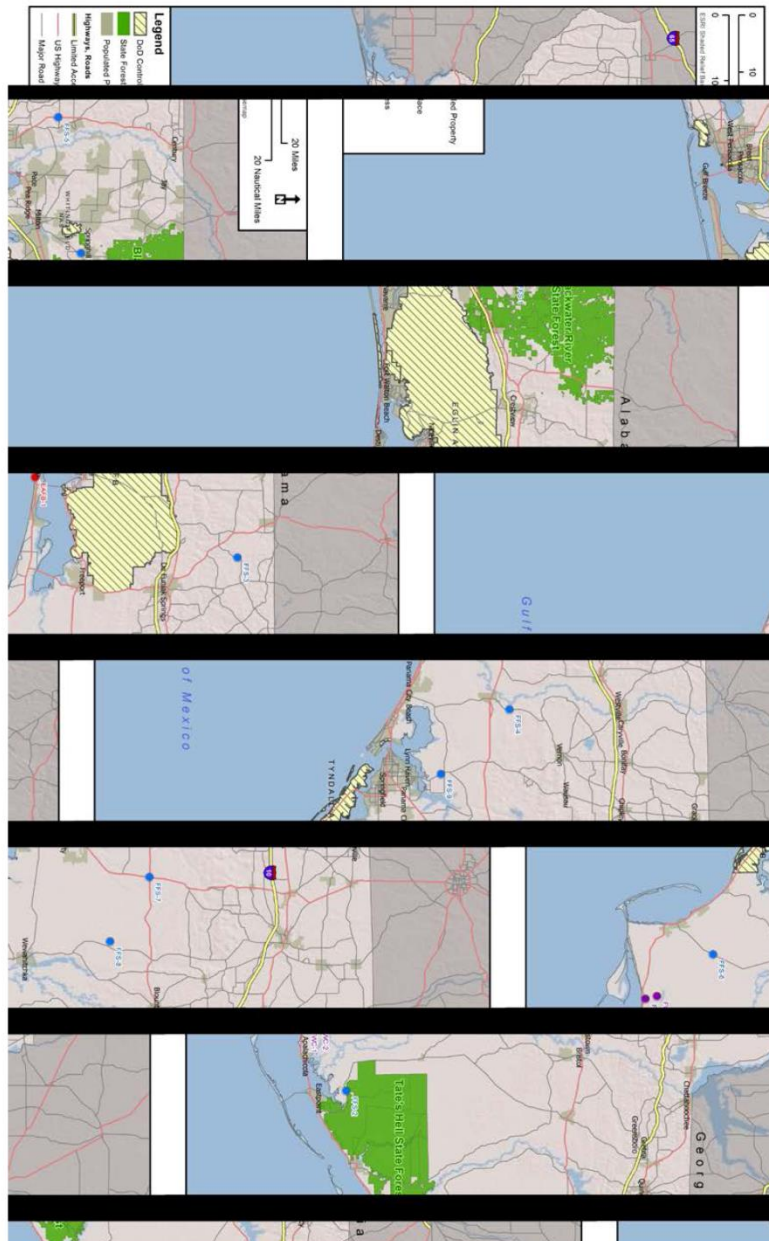


Figure 1-1. Location of Blackwater River and Tate's Hell State Forests, and Proposed Emitter Sites

January 2014

Biological Assessment for GRASI Landscape Initiative Training Areas
Eglin Air Force Base, FL

Page 1-2

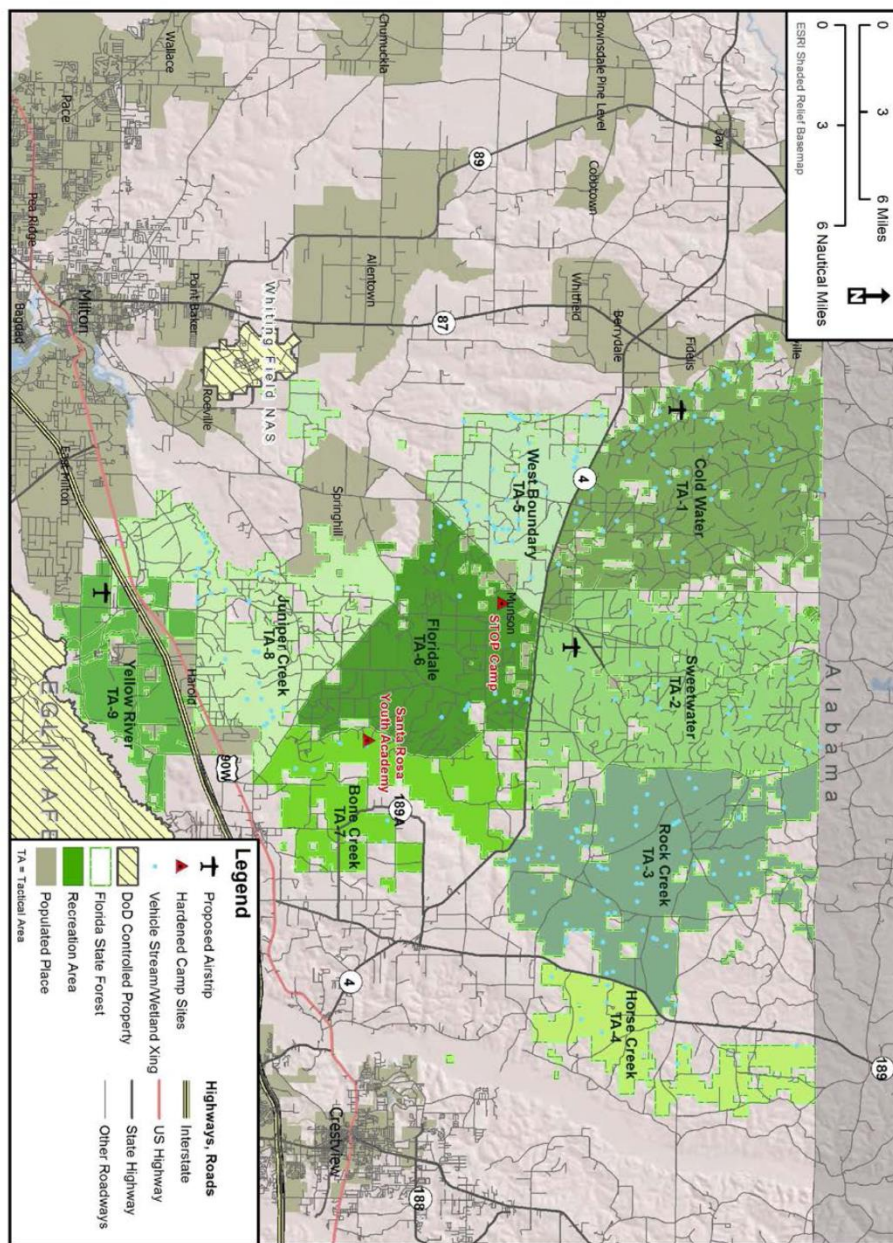


Figure 1-2. Blackwater River State Forest Tactical Areas

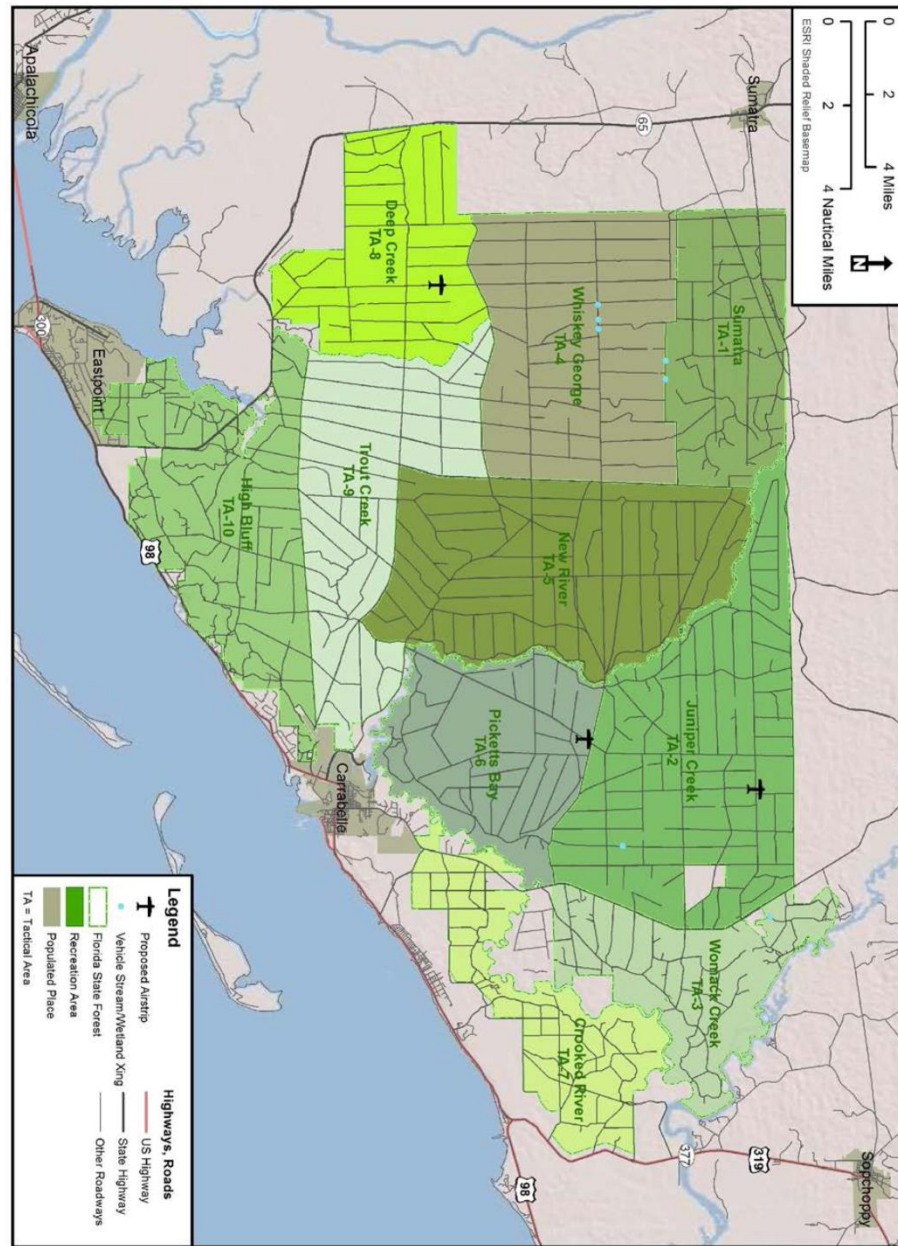


Figure 1-3. Tate's Hell State Forest Tactical Areas

2. DESCRIPTION OF PROPOSED ACTION

2.1 PROPOSED ACTION

This BA describes the potential consequences to federally listed species that may result from non-hazardous military training operations and the use of emitters within the GLI area (Figure 1-1, Figure 1-2, and Figure 1-3). The GLI is a United States (U.S.) Air Force-led partnership with the State of Florida and other state and federal agencies to improve the flexibility of the region to safely host military test and training operations. The Proposed Action is needed because there is a projected regional shortfall of military training and testing land and airspace in the GRASI region. Presently, the demand for restricted areas of airspace over Eglin AFB for high priority testing missions creates scheduling conflicts for lower priority nonhazardous training operations. The Proposed Action would improve scheduling flexibility and reduce competing demands on restricted areas.

2.2 SCOPE OF THE PROPOSED ACTION

The scope of the GLI encompasses the BRSF (~210,400 acres) and THSF (~202,400 acres) for general training operations, and small land areas at various locations in northwest Florida for permanent and mobile radar emitter sites (Figure 1-1). Training activities would involve some minor land disturbance (no land development), use of wheeled vehicles on established roads only, cross-country troop movements, bivouacking, helicopter and light aviation landings on established landing zones (existing roads and cleared areas), amphibious operations, and use of blank ammunition and pyrotechnics in select areas. Use of the forests would be accomplished through lease agreements with the Florida Forest Service (FFS).

2.2.1 Emitter Sites

The Proposed Action would include establishment of up to 12 radar, telemetry, and emitter sites on FFS and Florida Fish and Wildlife Conservation Commission (FWC) lands in northwest Florida at areas that are already “improved” or “semi-improved” to be used for tracking aircraft and navigation (Figure 1-1, Table 2-1). Most sites can accommodate line of sight (LOS) requirements without improvements; however, at two sites (FFS-8, FFS-9) some minor tree clearing/topping (less than 0.5 acres) would improve LOS. Power generation at each site would be provided either by generator or connection to available utilities. Some sites have available fencing, while others do not and may require fencing if used as a “temporary” site.

2.2.2 Training Activities in Northwest Florida State Forests

The Proposed Action consists of a number of different land, water, and air training activities, which currently occur on the Eglin AFB Range and are evaluated in detail in the *Estuarine Riverine Programmatic Environmental Assessment, Santa Rosa Island Range Environmental Assessment (REA)*, and *Interstitial Areas REA Revision 2* (U.S. Air Force, 2004; U.S. Air Force, 2012; U.S. Air Force, 2013a). The Air Force proposes to utilize BRSF and THSF for some of these activities; however, even at full program implementation, forest lands

would be used for only a relatively small percentage of training activities currently occurring on Eglin AFB. The frequency of use may increase gradually from no use up to the maximum-use scenario described in the Environmental Impact Statement (EIS). Training activities could occur in any of the “tactical areas” (TAs) shown in Figure 1-2 and Figure 1-3, with consideration of restrictions identified in the GRASI LI EIS and those determined through coordination with the FFS.

Table 2-1. Summary of Emitter Types and Proposed Locations

Site Identifier	Description	Security
FWC-1	Semi-improved, cleared area – both sites adjacent to each other.	Fencing required for temporary use.
FWC-2		
EAFB-1	Henderson Beach location – owned and operated by Air Force.	Security available.
FFS-1	Coldwater FS – improved site with paved areas, buildings, and watch tower.	
FFS-2	East Bay FS – improved site with paved areas, buildings, and watch tower.	
FFS-3	Semi-improved area near Jackson Still FFS tower site.	Fencing required for temporary use.
FFS-4	Semi-improved area near Moddy FFS tower site.	
FFS-5	Molino FS – improved site with paved areas, buildings, and watch tower.	Security available.
FFS-6	White City FS – improved site with paved areas, buildings, and watch tower.	
FFS-7	Youngstown FS – improved site with paved areas, buildings, and watch tower.	
FFS-8	Semi-improved area near Smith FFS tower site.	Fencing required for temporary use.
FFS-9	Vicksburg FS – improved site with paved areas, buildings, and watch tower.	Security available.

EAFB = Eglin Air Force Base; FFS = Florida Forest Service; FS = Forestry Site; FWC = Florida Fish and Wildlife Conservation Commission

The intent for implementing GRASI GLI training would be to start slowly and increase nonhazardous training utilization of THSF or BRSF to acceptable levels that can compatibly be supported by the FFS. Training would only be implemented to the extent that DoD units need the additional off-base training capacity to support nonhazardous activities. Due to safety limitations and existing policy, activities using live fire and duded munitions would not be conducted in proposed GRASI training areas. Because of these limitations and increased travel times required to access BRSF and THSF, total use of THSF or BRSF is anticipated to be well below the utilization rates of dedicated military ranges, which are utilized up to 232 days per year. Training utilization rates would be further reduced during hunting season and other times when military use would not be compatible with existing land uses. Numbers of personnel used during training activities typically range from 10 to 50 and may involve any number and type of vehicles. Personnel would travel to BRSF either by road or aircraft as part of a training exercise. Because of distance (150 to 200 miles depending on route taken), road travel to THSF would be infrequent, and most training activities would be associated with air transport of personnel and equipment to THSF tactical areas.

The following subsections detail proposed training activities, which would be carried out as part of either small unit training events or larger regional training exercises. These activities would be

carried out by units of the Air Force Special Operations Command (AFSOC), units of the 7th Special Forces Group (Airborne) [7 SFG(A)], F-35 Joint Strike Fighter and support units, and other DoD units. Training activities in the state forests would be conducted per the requirements of Eglin AFB Instruction (EAFBI) 13-212, *Range Planning and Operations*, Chapter 7 – Environmental Management (U.S. Air Force, 2010), as applicable, and in accordance with the respective state forest management plans. Additionally, training activities would implement, the Conservation Measures detailed in Section 2.3.

Helicopter Landing Zones/Drop Zones

Existing cleared areas within the state forests would be utilized as landing sites for helicopters and drop zones (DZs) for personnel and equipment from various aircraft (either fixed or rotary wing). Most HLZ/DZ locations will likely change over time based on open area availability and training needs. Existing FFS HLZs will also be used. At some sites, there may be improvements in the form of gravel surfaces.

Fixed-Wing Aircraft Landing Sites

Existing airfields and roadways would be used for fixed-wing aircraft landings, takeoffs, and touchdowns in support of training activities (Figure 1-2 and Figure 1-3). At BRSF, one existing airfield would be utilized (Munson Airfield), and two dirt roadways (one in TA-1 and one in TA-9) are proposed for aircraft operations. At THSF, three dirt roadways are proposed for aircraft operations. These roadways are located in TA-2, -6, and -8. Road improvements such as widening or compacting may be necessary; road widening would be limited to existing shoulder areas and would not involve direct physical impacts to wetlands or surface waters. There would be no paving or addition of impervious surface at any of the proposed landing sites, and their locations would not change in the near future.

Use of Expendables

Expendables use includes various training munitions and pyrotechnics during training activities. At BRSF, noise-generating expendables (e.g., blanks and ground burst simulators) would only be used at hardened camp site locations. Simulated munitions (consisting of plastic pellets or paintballs) and smoke grenades may be used during training activities described in this chapter in approved areas as detailed in Section 2.3. At THSF, noise-generating expendables could be used in approved areas as identified in Section 2.3. Table 2-2 lists details of maximum annual expendables activities.

Table 2-2. Expendables Usage Details

Expendable Type	Estimated Maximum Quantity Per Year	Estimated Average Per Event
5.56-millimeter blank	576,000	~10,000
7.62-millimeter blank	196,200	~8,000
Ground burst simulators	5,172	~2 to 5
M-18 smoke grenades	4,038	~2 to 5
Paintballs/plastic pellets	50,000	~5,000
Flares	Emergency use only – not associated with training activities	

Light Aviation Proficiency Training

Light aviation proficiency training refers to fixed-wing aircraft takeoff and landing training that would occur at the established fixed-wing aircraft landing areas identified previously. Aircraft would fly from the surface to approximately 3,000 feet above ground level (AGL) 90 percent of the time and up to 10,000 feet AGL the remaining 10 percent of the time. Each training event could be up to 2 hours in duration and may occur day or night, at a maximum tempo of five times per day (spread among multiple landing sites).

Low-Level Helicopter Insertions/Extractions

Helicopters would be used to conduct personnel insertion and extraction training at HLZs/DZs using ropes, ladders, and other means. Helicopters would generally fly between just above surface/tree level and 3,000 feet AGL. En route to HLZs/DZs, helicopters would fly at 100 to 500 feet AGL. After arriving, about 50 percent of the time would be spent flying patterns within a one- to two-mile radius of the HLZ, with the remaining time spent either hovering (80 percent of this time) or on the ground with engines running and rotors turning. Hovering altitude ranges from 15 to 75 feet AGL. Each training event would be 30 minutes to 2 hours in duration, with up to 50 personnel involved. Training would be conducted two times per month (spread out among the HLZs/DZs), with 50 percent occurring at night (20 percent after 10:00 pm).

Temporary Combat Support Areas

Tents and other equipment would be set up around HLZs/DZs and fixed-wing aircraft landing areas to provide training support such as logistics and medical treatment of simulated casualties. Temporary defensive positions (e.g., sandbag bunkers) may be used. No digging would occur. Events could occur day or night.

Airdrops

During airdrop training, aircraft would insert and/or resupply personnel by release of troops or equipment over land-based DZs or over water. Aircraft would fly at 1,250 feet AGL for static line drops and up to 25,000 feet AGL for free fall drops. During a typical scenario, the aircraft would approach the DZ at 500 to 1,000 feet AGL, conduct the drop, and move to orbit at 5,000 feet AGL, offset from the DZ by 5 to 10 miles. Airdrops could occur up to four times per day, with up to 72 personnel participating.

Air/Land Vertical Lift

Air/Land Vertical Lift would involve the insertion and/or resupply of personnel and/or equipment by landing an aircraft directly into an HLZ or on a fixed-wing aircraft landing area. Aircraft would fly from the surface to approximately 3,000 feet AGL 90 percent of the time, and up to 10,000 feet AGL for the remaining time. Up to four training events could occur per day, with up to 72 personnel participating.

Forward Air Refueling Point/Hot Gas Operations

These operations involve the transfer of fuel from aircraft to aircraft or refueling truck to aircraft with aircraft engines running. Fuel transport vehicles may range in capacity from several hundred to several thousand gallons and would travel between the training site and Eglin AFB. It is not likely that this activity would occur at BRSF because it is so close to Eglin AFB. This activity would only occur on hardened surfaces.

Cross-Country Dismounted Movements

Up to two times per quarter, personnel would move on foot across land areas from one location to another as part of simulated assault and reconnaissance training activities. Movements may occur day or night, on or off roads, or on unimproved trails. Movements may also include crossing of streams and wetland areas. Up to 72 personnel could be involved in each event.

Cross-Country Vehicle Movement

Up to three times per quarter, personnel transport vehicles would move across established roadways and associated easements from one location to another in support of resupply, logistics, and troop transport. Vehicles would include high-mobility multipurpose wheeled vehicles (HMMWVs), 2.5-ton trucks, all-terrain vehicles (ATVs), and other small vehicles (e.g., motorcycles).

Vehicle Stream and Wetland Crossing

Vehicle stream and wetland crossing involves military vehicles (listed in previous section) fording intermittent and perennial streams and wetlands at low water crossing points currently established and utilized by the FFS (Figure 1-2 and Figure 1-3). Training events could occur during daylight or nighttime hours up to three times per quarter, with up to ten vehicles per event.

Blackout Driving

Blackout driving involves nighttime operation of ATV-type vehicles and HMMWVs without full headlights. Headlights would be diminished to “cat eyes,” which are essentially small slits placed over the headlights; this provides enough light to utilize night vision goggles while driving. Roads used for this activity would be temporarily closed (likely in concert with emplacement of obstacles, described below) to the public to prevent safety mishaps. Training events could occur up to three times per quarter, with up to ten vehicles per event.

Emplacement of Obstacles

Concertina wire and barbed wire would be placed along unpaved roads and Hardened Camp Sites (discussed below) up to ten times annually. The ground surface could be slightly disturbed (within six inches of ground surface) from placement of stakes and pickets. All wire, stakes and/or pickets would be recovered after training is complete.

Bivouacking/ Assembly Areas

This training activity involves the use of an area, mainly tented, where troops eat and rest overnight. There may be slight surface ground disturbance from placement of tent stakes and pickets. All expendables/equipment would be recovered prior to leaving the site. Up to ten training events could occur per year, with up to 72 personnel involved in each event.

Communications and Surveillance Operations

Communications and surveillance operations involve the use of sites to coordinate communications and/or conduct surveillance of “enemy forces.” Communications equipment, radar equipment, and generators would be used during these operations. The ground surface may be slightly disturbed from placement of tent stakes and pickets. These operations would occur monthly and involve up to 72 personnel per event.

Amphibious Operations

Amphibious operations involve boat operations on the water, including loading/unloading of personnel to and from boats and movement in streams, rivers, bays, and lakes. Potential boat types include inflatable and rigid powered watercraft up to 28 feet in length and with outboard motors of 35 to 200 horsepower (e.g., Zodiacs or aluminum boats). Up to six watercraft could participate in each training event, with up to 10 events annually. Training could occur during daylight or nighttime hours.

Natural Resource Consumption

This training involves the procurement of natural food sources, such as small game and rodents (utilizing survival techniques such as trapping/snaring) and consumption of vegetation. Sensitive species and habitats would be avoided. Training could occur up to two times per quarter, day or night, with up to 20 personnel involved per training event.

Overwater Hoist Operations

This training involves hoist rescue and recovery of personnel and watercraft over water. Aircraft would conduct operations from just above the surface of the water to a height of about 150 feet. Aircraft would hover about 10 feet over the surface for drops and about 80 feet above the surface for retrievals. Training could occur up to once per month, day or night, for four to six hours per event.

Opposing Forces Vehicle Operation

During this training, two teams would compete to locate each other on established roads in a simulated urban environment. Personnel may exit vehicles to conduct “search activities.” A light aircraft may be used to direct one of the teams; the aircraft would fly at between 16,000 and 23,000 feet AGL. Training could occur up to five times per week, day or night, with up to 10 vehicles/50 personnel per event.

Hardened Camp Site Use

This training involves use of two hardened camp facilities located at BRSE. Both camps were established by the Florida State Department of Juvenile Justice and include the Short Term Offender Program (STOP) Camp and the Santa Rosa Youth Academy (SRYA) (Figure 1-2). These sites consist of buildings and infrastructure such as utilities and roadways, and may be used as insertion/extraction points, HLZs/DZs, command and control centers, training areas for combat in urban environment training, or other training activity support. A variety of aircraft and vehicle types could be used. Training could occur up to five times per week, day or night, with up to 50 personnel per event.

2.3 CONSERVATION MEASURES

The proponent will implement the following Conservation Measures as part of the Proposed Action to minimize or offset potential adverse impacts. This BA considers these requirements as part of the impact assessment. Additionally, the FFS will continue to support and protect their sensitive species and habitats as detailed in their forest management plans (i.e., operations and management plans for RCWs and fire).

Prior to implementation of the Proposed Action, the Air Force will:

1. Develop a Mitigation Plan identifying proposed resource-specific mitigations to be implemented, responsible parties for mitigation implementation and compliance evaluation, and monitoring mechanisms for evaluation of mitigation effectiveness.
2. Establish a Landscape Initiative Team composed of appropriate Eglin organizations to coordinate with pertinent Eglin offices/disciplines and the FFS. The Team will provide oversight to ensure the following requirements are implemented and the required supporting processes are established for implementation prior to any missions on state forest lands:
 - a. Develop real property leases/agreements that incorporate the conservation measures identified in this BA.
 - b. Develop and implement a methodology for scheduling training activities, through existing Eglin organizations, which incorporates the conservation measures identified in this BA, and addresses any violations, including enforcement.
 - c. Develop and implement a methodology to identify specific training areas and corridors prior to ground operations to allow for any natural resource surveys and protection measures that may be necessary (i.e., RCW surveys).
 - d. Develop and implement a methodology, through coordination with appropriate Eglin agencies and disciplines, for pre- and post-mission surveys of action areas to identify the extent of environmental impact to training areas, to correct any issues, and to adjust constraints and mitigations as necessary.
 - e. Identify designated boat landing areas for amphibious operations that occur in Gulf sturgeon and freshwater mussel critical habitat on the Yellow and Ochlocknee rivers, and in Apalachicola Bay and East Bay, preferably with improved surfaces.

- f. Identify and implement funding/reimbursement mechanisms to pay for conservation measures.
 - g. Develop addendums/attachments to EAFBI 13-212 Chapter 7 for BRSF and THSF to identify environmental considerations detailed in this BA.
 - h. Develop a Wildfire Specific Action Guide for GLI activities at BRSF and THSF, including fire checks and restrictions on campfires and pyrotechnics use during high fire danger periods. Fire danger restrictions will be established cooperatively between the FFS and Eglin Wildland Fire Program. Restrictions will generally be as follows: On days when the local state forest Fire Danger Rating is Very High or Extreme, no pyrotechnics use or campfires will be allowed without prior approval of the Eglin Wildland Fire Program Manager and the state forest Fire Manager. For days with High Fire Danger, pyrotechnics will be restricted to hand-thrown simulators and smoke grenades, and are to be used only on roads or in pits; no campfires are allowed.
 - i. Ensure compliance with environmental requirements by identifying the proper organizations responsible for management of each conservation measure, and ensuring the responsible organization has executed the intent of the applicable requirement.
3. Identify appropriate Eglin AFB program offices to implement the following conservation measures, with funding/support from training units:
- a. Develop forest-specific guidance on environmental restrictions and compliance requirements, to include conservation measures identified in this BA (i.e., environmental briefings, EAFBI 13-212 addendum).
 - b. Coordinate with the FFS to identify time and area constraints for training activities (e.g., avoidance of sensitive areas) and incorporate these constraints into unit training plans.
 - c. Develop and implement a process that will notify Eglin Natural Resources of the dates and locations of upcoming training events to support spot surveys/inspections for compliance.
 - d. When determining preferred locations for HLZs/DZs and fixed-wing aircraft landing sites, ensure incorporation of protected species buffers where no aircraft operations are permitted (1,000 foot buffer around bald eagle nests from 01 October to 15 May, and 500-foot buffer around RCW trees and wood stork feeding/roosting habitat).
 - e. Provide conservation measures from this BA to unit commanders and training personnel. This can be accomplished through Eglin AFB Range Safety and Operations Procedures (RSOP) annual briefings, additional site-specific environmental briefings (i.e., BRSF and THSF), EAFBI 13-212, and/or through the Eglin AFB Center Scheduling Enterprise (CSE).
 - f. Track briefings, inspections, restrictions, and reports for regulators in accordance with current Eglin procedures.

- g. Annually provide ground training units with global positioning system (GPS) coordinates for current protected species locations, including RCW trees, bald eagle nests, and wood stork roosting/feeding areas.
- h. Document and resolve any issues related to environmental compliance with the FFS upon notice of any compliance issues.
- i. Monitor conditions of high-use training areas, including the hardened camp sites, HLZs/DZ, and fixed-wing aircraft landing sites, to ensure areas are not overused (i.e., show signs of degradation or adverse impact) and do not expand beyond established boundaries.
- j. Survey proposed new training locations (including airstrips and HLZs) for protected/sensitive species, and survey existing training areas at least every 3 years to identify any new sensitive species that have moved into the area. As necessary, update associated operational constraints and GLI Protection Level maps.
- k. Prior to any activity that has the potential to create significant soil disturbance, complete a gopher tortoise survey. If a gopher tortoise burrow is found during the survey that cannot be avoided, then Eglin must obtain a gopher tortoise relocation permit from the FWC and conduct the relocation of the tortoise and any commensal species (i.e., indigo snake) in accordance with FWC protocols (described at <http://myfwc.com/media/1410274/GTPermittingGuidelines.pdf>) and the *Eglin AFB Indigo Snake Programmatic Biological Opinion* (USFWS, 2009c).
- l. Prior to any activity that has the potential to create significant soil disturbance, conduct a survey for federally listed plants. If listed plants cannot be avoided, additional consultation under the ESA is required.

Prior to any training activities, unit personnel will:

- 1. Schedule training areas through Eglin AFB.
- 2. Acquire current RCW, eagle, and wood stork buffer locations from Eglin AFB and either load these into GPS devices or add to field maps.
- 3. Review GLI Protection Level maps and incorporate restricted areas into field maps as necessary, particularly for those areas not marked in the field (i.e., flatwoods salamander and piping plover critical habitat).
- 4. Once specific training areas and corridors are identified for the upcoming year, these areas must be surveyed for RCW cavity trees and bald eagle nests, and active trees must be marked. Coordinate with Eglin Natural Resources and the FFS to ensure that any necessary species surveys and markings are completed prior to ground operations.
- 5. Coordinate with Eglin AFB to schedule an in-briefing on environmental restrictions for unit commanders and training personnel prior to first time training at the emitter sites, BRSF and THSF; then at least annually thereafter.
- 6. Units must ensure environmental restrictions are communicated to all unit personnel that have a ground training requirement, including students, in verbal or written form prior to first time training on BRSF and THSF.
- 7. Route requests for land disturbing activities through Eglin AFB and the FFS for approval.

January 2014

Biological Assessment for GRASI Landscape Initiative Training Areas
Eglin Air Force Base, FL

Page 2-9

During training activities, unit personnel will adhere to the following conservation measures.

General

1. Units must follow the restrictions shown on GLI Protection Level maps (as defined in Table 2-3), and all applicable restrictions detailed in EAFBI 13-212. Electronic or hard copy maps showing these protected areas will be provided to units. These maps will be updated annually or more frequently if needed.

Table 2-3. Sensitive Species Protection Levels for GLI Ground Operations

Protection Level	Restrictions	Area Covered
Prohibited	No access is permitted.	Piping plover critical habitat
Restricted	All activities must remain on roadbeds of established roads, including troop movements, expendables use, vehicle operations, digging, and any type of ground surface disturbance. No refueling of vehicles or aircraft allowed.	1,500 feet around flatwoods salamander habitat; Sensitive species point locations and associated FNAI sensitive habitats; pitcher plant bogs; rare plants; rare animals
RCW Buffer	Follow <i>Management Guidelines for the Red-Cockaded Woodpecker on Army Installations</i> (U.S. Army, 2007).	200 foot buffer around RCW cavity trees for ground operations; 500 ft buffer restricting aircraft operations and HLZs/LZs
Bald Eagle Nests	During nesting season (October 1 to May 15), follow <i>National Bald Eagle Management Guidelines</i> (USFWS, 2007).	1000 ft buffer around nest for aircraft operations; 330 ft buffer for ground training operations
Wood Stork Habitat	Follow <i>Habitat Management Guidelines for the Wood Stork in the Southeast Region</i> (USFWS, 1990).	500 ft buffer around wood stork feeding/roosting habitat
Limited Use-1 (LU-1)	<u>Approved Activities:</u> use of star cluster pyrotechnics (hand-held slap flares) only for emergency purposes; use of non-lethal small arms ammunition such as blanks and paintballs (at BRSF approved for paintballs only). Dismounted maneuver and incidental and consumptive land disturbance. <u>Not Approved:</u> use of smokes, flares, or simulators; off-road vehicle use – all vehicles must remain on established roads; land development and point land disturbance outside of previously disturbed roadbeds and road shoulders. LZ/DZ use except on approved FFS sites not requiring additional land development. No refueling of vehicles or aircraft allowed.	100 feet around wetlands, water bodies and floodplains; Areas exhibiting very limiting soil characteristics (e.g., susceptible to erosion) for HLZ and/or bivouacking
Limited Use-2 (LU-2)	<u>Approved Activities:</u> use of pyrotechnics (e.g., smoke grenades and GBSS) and non-lethal small arms ammunition such as blanks and paintballs (at BRSF approved for smoke grenades and paintballs only, with GBSS permitted only at hardened camp sites). Dismounted maneuver. Incidental, point, and consumptive land disturbance (includes catholes) outside of previously disturbed roadbeds and road shoulders if approved by FFS. LZ/DZ use only on approved FFS sites with FFS coordination required for any additional land disturbance.	All areas not covered by other protection levels.

Protection Level	Restrictions	Area Covered
	Refueling of vehicles or aircraft allowed only on asphalt or concrete surfaces. <i>Not Approved:</i> off-road vehicle use – all vehicles must remain on established roads.	

BRSF = Blackwater River State Forest; DZ = drop zone; FFS = Florida Forest Service; FNAI = Florida Natural Areas Inventory; GBS = ground burst simulator; HLZ = helicopter landing zone; LU-1 = Limited Use-1; LU-2 = Limited Use-2; LZ = landing zone; RCW = red-cockaded woodpecker; USFWS = United States Fish and Wildlife Service

2. Follow restrictions in EAFBI 13-212.
3. Restrict training to only those tactical areas, landing/drop zones, and fixed-wing aircraft landing sites scheduled through Eglin AFB.
4. Follow Eglin and/or FFS spill prevention and spill response procedures. Immediate containment and spill response actions are required for petroleum, oil, and lubricant (POL) spills. Disposal/discharge of hazardous materials to the ground or in water is prohibited.
5. Check the fire danger rating daily for the state forest where training activities are to occur, and follow applicable restrictions.
6. If any federally or state-listed species is found dead or injured, immediately notify the GLI Liaison and Eglin AFB.
7. If an indigo snake, gopher tortoise, or black bear is sighted, allow the animal to leave the area undisturbed; notify the GLI Liaison and Eglin AFB.
8. Avoid gopher tortoise burrows by 25 feet, and mark burrow buffer as necessary in high traffic areas.
9. Do not cut down any trees, for any reason, and do not use sensitive vegetation (i.e., protected species) as part of natural resource consumption.
10. Follow guidance provided in the forest-specific environmental restrictions regarding approved plant and animal species for camouflage and consumption.
11. Follow *Management Guidelines for the Red-Cockaded Woodpecker on Army Installations* (U.S. Army, 2007) (Table 2-4), *National Bald Eagle Management Guidelines* (USFWS, 2007), and *Habitat Management Guidelines for the Wood Stork in the Southeast* (USFWS, 1990) during ground training activities and air operations.
12. Activities within 200 feet of identified RCW trees will not exceed two hours.
13. The GLI Liaison and Eglin AFB must be notified within 24 hours for the following occurrences:
 - a. RCW cavity tree is damaged (including wildfire damage) to the point it is unsuitable for nesting or roosting.
 - b. RCW cavity trees, cavity start trees or the surrounding soils are inadvertently damaged or disturbed during ground maneuvers.

Table 2-4. GRASI LI Training Activities Allowed/Not Allowed Within 200 ft of RCW Cavity Tree

Mission Activity	Allowed
Maneuver and Bivouac:	
Hasty defense, light infantry, hands and hand tool digging only, no deeper than 2 feet, 2 hours MAX	Yes
Deliberate defense, light infantry	No
Establish command post, light infantry	
Assembly area operations, light infantry	
Establish combat support/combat service support (CS/CSS) sites	
Establish signal sites	
Foot Transit through the Cluster	Yes
Wheeled Vehicle Transit through the Cluster ⁽¹⁾	
Cutting Natural Camouflage, Hard Wood Only	
Establish Camouflage Netting	No
Vehicle Maintenance for No More than 2 Hours	Yes
Weapons Firing:	
7.62 mm and Below Blank Firing	Yes
.50 cal Blank Firing	
All others	No
Noise:	
Generators	No
Pyrotechnics/Smoke:	
CS (2-chlorobenzalmononitrile)/Riot Agents	No
Smoke Grenades	Yes
Incendiary Devices to Include Trip Flares	
Star Clusters/Parachute Flares	
Hexachloroethane (HC) Smoke of any Type	No
Digging:	
Deliberate Individual Fighting Positions	No

Source: U.S. Army, 2007; Table was modified to show only the activities that may occur as part of GRASI LI training.

1. Vehicles will not get any closer than 50 feet of a marked cavity tree unless on existing roads, trails, or firebreaks.

2. Smoke generators and smoke pots will not be set up within 200 feet of a marked cavity tree, but the smoke may drift through the 200-foot circle around a cavity tree.

Dismounted Maneuver

1. Follow restrictions identified in Table 2-3 and on the GLI Protection Level maps.
2. Do not enter Prohibited Areas: these are off-limits to all activities.
3. Avoid concentrated troop movements on steep slopes and in wetlands.
4. Do not step on, fill, or in any way cause a gopher tortoise burrow to collapse.

Land Disturbance

1. Prior to any land disturbance (e.g., tree clearing for LOS), sensitive species surveys must be conducted, and any identified sensitive species and associated habitat must be avoided. If avoidance is not possible, then additional consultation under the ESA is likely to be required.

2. No land disturbance is permitted within 25 feet of gopher tortoise burrows. A gopher tortoise survey and relocation would be required if a burrow cannot be avoided (see requirements described in Conservation Measure “k” on page 2-13).
3. Point land disturbance is authorized only in Limited Use-2 areas.
4. All digging must be approved through coordination with the GLI Liaison, FFS, and Eglin AFB prior to field activities.
5. For approved dig activities, units must fill in holes once training is complete and cover them with pine straw and leaves.

Mounted Maneuvers

1. Follow restrictions identified in Table 2-3 and on the GLI Protection Level maps.
2. Fueling of vehicles is allowed only in Limited Use-2 areas (defined in Table 2-3) over asphalt or concrete. Follow Eglin and/or FFS spill prevention and spill response procedures.
3. Keep vehicles, including ATVs, on established roads at all times – approved roadways and parking areas are designated by the GLI Liaison and FFS.
4. Use only the low water crossings that have been approved by the FFS and the GLI Liaison. Vehicle access will be prohibited at crossings rated in poor condition, and those on known Westfall’s clubtail streams.
5. Prior to driving across a low water stream crossing, check for turtles and allow them to clear the crossing before use.
6. Do not enter Prohibited Areas: these are off-limits to all activities.
7. Avoid driving on roads with erosion issues; report any erosion issues to the GLI Liaison.
8. Prior to use on BRSF and THSF, and prior to use again at Eglin AFB, inspect all out-of-area equipment for invasive non-native species, and clean in accordance with Armed Forces Pest Management Board Technical Guide No. 31, Retrograde Washdowns: Cleaning and Inspection Procedures:
<http://www.afpmb.org/pubs/tims/tg31/tg31.pdf>.

Bivouacking

1. Campfires are not authorized except at hardened camp sites with prior approval through the GLI Liaison and Eglin AFB. The fire danger rating for each forest must be checked daily, and BRSF and THSF dispatch must be notified if any campfires are proposed. If any fires are approved, units must follow forest-specific restrictions as identified by the respective forest fire dispatch.
2. Minimize water consumption from rivers and streams.
3. Do not dam or divert water from streams or wetlands.
4. Do not use soap or other cleaners in streams or ponds.
5. Pack out trash. At no time will trash be buried or burned in a tactical area.

6. Use chemical latrines for human waste disposal whenever possible during field training missions, and only in areas approved by the FFS. When chemical latrines are not available, a cat-hole latrine or saddle trench latrine can be used in accordance with service command directives.
7. Hardstand and tent complex bivouacs are permitted only in previously cleared and disturbed areas around the perimeter of HLZs and DZs.

Expendable/Equipment Use

1. Follow restrictions identified in Table 2-3 and on the GLI Protection Level maps.
2. Live rounds are not authorized.
3. Portable generators must be approved by the GLI Liaison, Eglin AFB and FFS, and used in accordance with each respective policy, including containment measures and spill kits. Generator use is prohibited within 200 feet of RCW trees.
4. Areas with concertina/barbed wire and trip wire must be manned, and units must remove all wire once training is complete.
5. Do not throw smokes, flares, or simulators directly into a water body.
6. Avoid deposition of blank casings, marking cartridges, Chem-lites, and pyrotechnics debris into water.
7. Do not release chemicals or metals into streams, wetlands, or water bodies.
8. Do not release toxic aerosols within 300 feet of streams, wetlands, or water bodies.
9. Abandoning, dumping, burying or otherwise concealing munitions, pyrotechnics or residue from these items, including packing materials is prohibited.
10. Coordinate with the on-site FFS dispatch prior to initiation of field activities to check the fire danger rating daily for the forest where activities are to occur; follow all pertinent fire restrictions.
11. Conduct a fire check (visual observation) after the use of pyrotechnics or munitions has ceased; duration of the check will be dependent on the fire danger rating.
12. When a fire is started in a tactical area, the officer in charge will stop all training and concentrate on fighting the fire using all available personnel in accordance with guidance established in Chapter 6, Fire Fighting, of EAFBI 13-212.
13. Report wildfires immediately to the GLI Liaison, Eglin AFB and FFS Fire Dispatch.
14. Follow the *Management Guidelines for the Red-Cockaded Woodpecker on Army Installations* (U.S. Army, 2007) (Table 2-4).
15. Coordinate with the GLI Liaison and Eglin AFB to ensure the following Air Force Instruction (AFI) 32-7064 requirement is met: User groups responsible for wildfire starts are required to ensure that sufficient resources (i.e., fire management personnel and equipment) are available to respond to wildfires.

Air Operations

1. Use only approved fixed-wing aircraft landing sites, HLZs, and DZs.
2. Incorporate restrictions from Table 2-3 and the GLI Protection Level maps (i.e., no air operations within 500 ft of RCW trees, 500 ft of wood stork feeding/roosting habitat, or 1,000ft of eagle nests) into flight plans.
3. Notify GLI Liaison and Eglin AFB of any landing zone that shows signs of overuse.
4. Fueling of aircraft is allowed only in Limited Use-2 areas (defined in Table 2-3) over asphalt or concrete. Follow Eglin and/or FFS spill prevention and spill response procedures.
5. Coordinate through the GLI Liaison and Eglin AFB the need for any land clearing or improvements for a landing zone.
6. Suspend CV-22 landings at grassy sites on days with a high fire danger rating.

Amphibious Operations

1. Use only those boat landing sites designated by the GLI Liaison, through coordination with the FFS. To the extent possible, boat landings should occur on established, hardened boat ramps for ingress/egress of amphibious craft, particularly on the Yellow and Ochlocknee rivers and Apalachicola and East bays. If ingress/egress must utilize natural habitat in wetlands, care should be taken to prevent destruction of wetland vegetation or other activities that might cause shoreline erosion. Ingress/egress points at non-hardened locations for both personnel and watercraft should be rotated to the extent possible to allow sites time to recover from amphibious operations.
2. Avoid contact of boat propellers with submerged vegetation (i.e., seagrass beds).
3. Notify the GLI Liaison and Eglin AFB of any shoreline/bank areas that show signs of overuse.
4. Keep boats clean to prevent introduction of invasive or nonnative species from other aquatic environments. Boats from out-of-town units must be verified clean before using them in local rivers, creeks and estuaries.

After field training activities, unit personnel will:

1. Police training areas to ensure that no trash, ammunition boxes, wire, munitions cartridges, or other debris has been left in the area and all excavations are filled.
2. Coordinate with the GLI Liaison and Eglin AFB on site surveys to detect environmental impacts by providing requested information.
3. Coordinate with the GLI Liaison and Eglin AFB to correct or repair environmental impacts caused by training activities
4. Report excessive damage to roads, vegetation, or training assets (i.e., HLZs, boat landing sites) to the GLI Liaison and Eglin AFB. Damage must be assessed and necessary corrective measures taken.

3. BIOLOGICAL INFORMATION

The sixteen federally listed species on or adjacent to BRSF and THSF listed in Table 3-1 were considered for this action, and are described in Section 2.3. The following additional species were also considered: gopher tortoise, bald eagle, and several plant and animal species which are on the Petitioned list for the USFWS (Section 3.2). Multiple state listed species also occur on these forests, and are discussed generally in Section 3.2.

Table 3-1. Federally Listed Species Within or Adjacent to the Proposed Action Areas

Common Name	Scientific Name	Federal Status	Location
Red-cockaded woodpecker	<i>Picoides borealis</i>	Endangered	BRSF, THSF
Wood stork	<i>Mycteria americana</i>	Endangered	THSF
Reticulated flatwoods salamander*	<i>Ambystoma bishopi</i>	Endangered	BRSF
Frosted flatwoods salamander*	<i>Ambystoma cingulatum</i>	Threatened	THSF
Eastern indigo snake	<i>Drymarchon couperi</i>	Threatened	BRSF, THSF
Piping plover*	<i>Charadrius melodus</i>	Threatened	THSF
Gulf sturgeon*	<i>Acipenser oxyrinchus desotoi</i>	Threatened	BRSF, THSF
Purple bankclimber*	<i>Elliptioideus slootianus</i>	Threatened	THSF
Choctaw bean*	<i>Villosa choctawensis</i>	Endangered	BRSF
Narrow pigtoe*	<i>Fusconaia eschambia</i>	Threatened	BRSF
Southern sandshell*	<i>Hamiota australis</i>	Threatened	BRSF
Fuzzy pigtoe*	<i>Pleurobema strodeanum</i>	Threatened	BRSF
Godfrey's butterwort	<i>Pinguicula ionantha</i>	Threatened	THSF
Florida skullcap	<i>Scutellaria floridana</i>	Threatened	THSF
White birds-in-a-nest	<i>Machiridea alba</i>	Threatened	THSF
Teleplus spurge	<i>Euphorbia telephioides</i>	Threatened	THSF

*Critical habitat for this species is also present on or adjacent to the state forests.

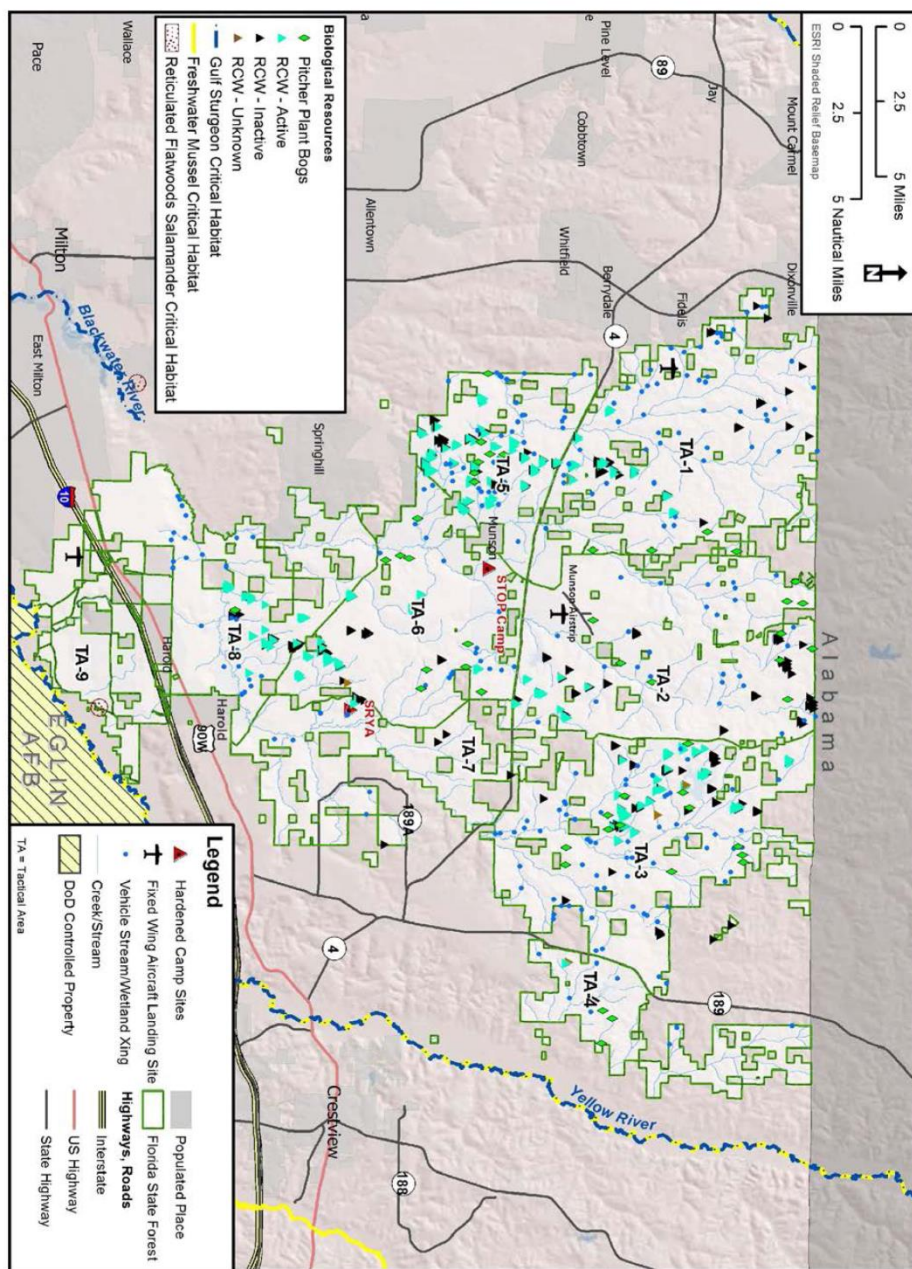


Figure 3-1. Federally Listed Species Within or Adjacent to BRSF

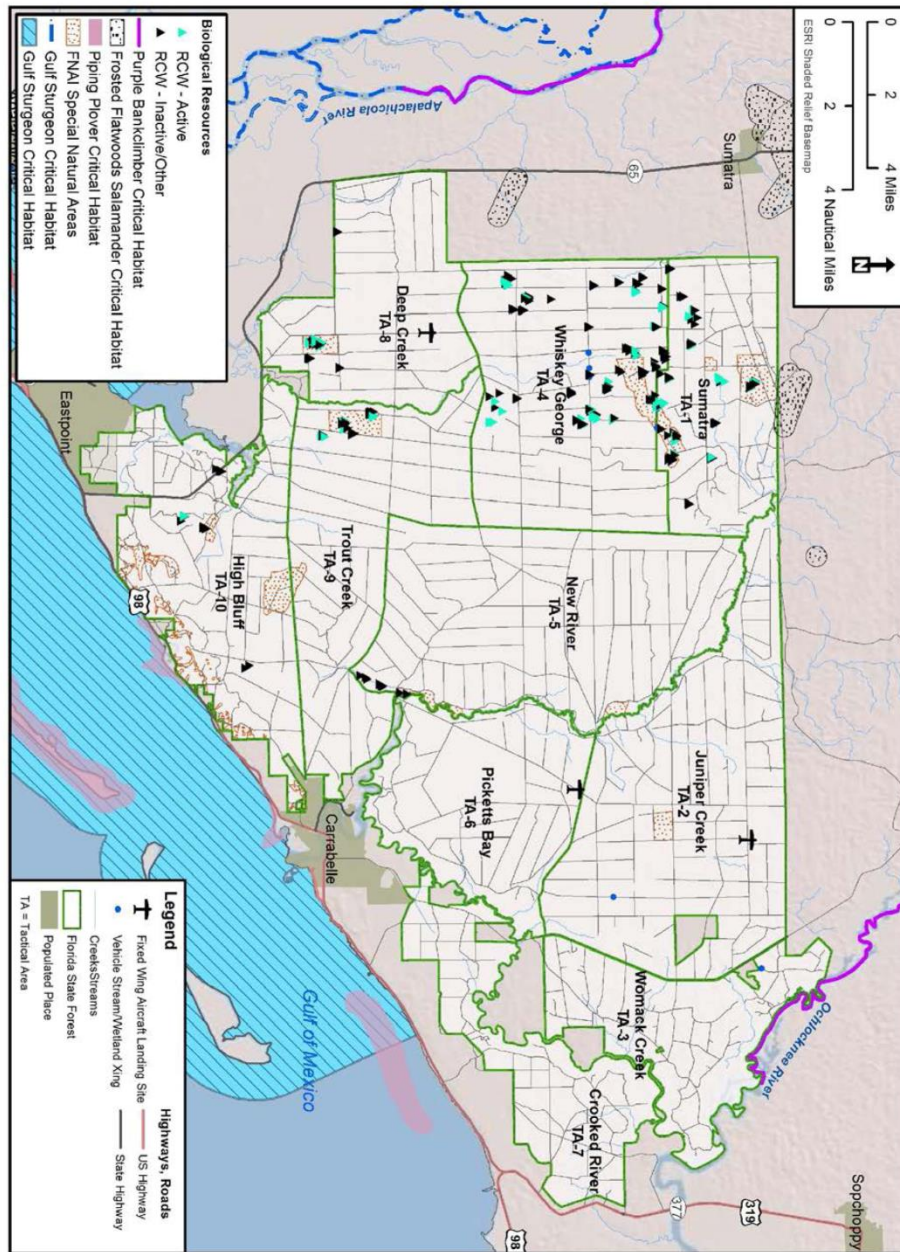


Figure 3-2. Federally Listed Species Within or Adjacent to THSF

3.1 FEDERALLY LISTED SPECIES

3.1.1 Red-cockaded Woodpecker

The red-cockaded woodpecker (RCW) (*Picoides borealis*) is listed as a federal and state endangered bird species. The RCW historically had a habitat range as far north as New Jersey and as far west as Oklahoma. Today, the RCW is restricted to the southeastern United States, from Florida to Virginia and to southeast Texas, due to habitat loss. Habitat loss and fragmentation is the greatest threat to RCW populations. RCWs occur in a variety of pine species ecosystems. In Florida, RCWs inhabit slash, longleaf, and loblolly pines.

This species does not migrate, maintaining year-round territories near its nesting and roosting trees (USFWS, 2008), which are termed *clusters*. An RCW cluster typically encompasses about 10 acres with most cavity trees likely within a 1,500-foot diameter circle. The woodpeckers primarily feed on spiders, ants, cockroaches, centipedes, and insect eggs and larvae that are excavated from trees. Dead, dying, and lightning-damaged trees that are infested with insects are a preferred feeding source. The birds also feed on the fruits of black cherry, southern bayberry, and black tupelo. Within the area of GLI activities, the RCW excavates cavities in live pine trees that are typically at least 85 years old. In the Southeast, 98 percent of the longleaf pine forests have been removed, making relatively undeveloped state and federal lands primary habitat for the species.

High-quality RCW forage habitat consists of open pine stands with tree diameter at breast height (dbh) averaging 10 inches and larger. While 100 acres of mature pine is sufficient for some groups, birds commonly forage over several hundred acres where habitat conditions are not ideal (Jackson et al., 1979). In systems with medium to high productivity, only 120 acres may be needed, whereas at sites with low productivity 200 to 300 acres of foraging habitat may be required (USFWS, 2003). General population recommendations for good quality foraging habitat include 18 or more stems per acre that are greater than 60 years in age and greater than 14 in dbh. Another requirement for good quality habitat is that it contains forbs and bunchgrasses in the understory, and has sparse or no hardwood midstory.

Consultation guidelines require that military training within 200 feet of marked cavity trees be limited to military activities of a transient nature (less than two hours occupation), and military vehicles are prohibited from occupying a position or traversing within 50 feet of a marked cavity tree, unless on an existing road or maintained trail or firebreak. Prohibited activities within the 200-foot buffer include bivouacking, excavating, digging, and establishing command posts. In addition, if timber is to be removed within 0.5 mile of active cavity trees, then a foraging habitat analysis must be completed to determine potential impacts. Consultation is required if resulting resources fall below USFWS guidelines.

BRSF

BRSF is adjacent to Eglin AFB and Conecuh National Forest, which together provide a large tract of suitable RCW habitat. The RCW population on BRSF is part of the Blackwater/Conecuh

secondary core population of the East Gulf Coastal Plain Recovery Unit (USFWS, 2003). The combined minimum number of PBGs for this core population at the time of delisting is 250. In addition, the goal at delisting is 309 and 45 active clusters in Conecuh National Forest and BRSF, respectively.

RCWs occur throughout the BRSF, but clusters are concentrated in three general areas (Figure 3-1) (Langston, 2013). The number of Potential Breeding Groups (PBGs) and clusters has been steadily increasing since the late 1990s, and there are currently over 90 PBGs and 94 active clusters in the BRSF (FDACS and FFS, 2013).

RCW recovery activities being implemented at BRSF include monitoring, artificial cavity installation, burning and mowing, and bird translocations. The average fire return interval is 2-3 years in RCW areas. RCW cavity trees are prepared prior to prescribed fires by cutting brush down around the tree and raking away the litter. Post-wildfire inspections include checks with a peeper scope and evaluation of whether tree damage has occurred. If a damaged or dead tree is identified, then BRSF typically will install a replacement cavity in a nearby tree; currently the forest installs approximately 10 replacement cavities annually. Known active and inactive clusters are monitored annually; however, a comprehensive survey program has not been established for BRSF to help systematically survey for new trees or clusters.

THSF

THSF is part of a large contiguous tract of managed forested area extending from the Apalachicola River to near Tallahassee, which supports a total of approximately 638 RCW clusters (NAS, 2013). THSF is part of the Central Florida Panhandle primary core population of the East Gulf Coastal Plain Recovery Unit (USFWS, 2003). Other managed areas supporting this core population include the Apalachicola National Forest, Ochlockonee River State Park, and St. Mark's National Wildlife Refuge. The combined minimum number of PBGs for the Central Florida Panhandle population at the time of delisting is 1,000. The goal is 400 active clusters in THSF.

During annual RCW cluster monitoring, biologists visit all known trees to determine status (active, inactive, dead), and to record cavity trees that have been damaged or killed by fire. In 2009, checks identified 102 active trees within 26 active clusters (Figure 3-2). The number of active clusters continues to increase steadily, with 37 active clusters including 112 active trees as of 2012 (FDACS, 2012). THSF personnel survey approximately 20% of the forest each year for new RCW trees. It is necessary to survey some portions of THSF by helicopter (December to January) due to the remoteness and difficulty with reaching those areas.

RCW-related management activities include mechanical hardwood control, longleaf pine plantings, prescribed fire, bird monitoring, and use of artificial cavities to create recruitment clusters or to supplement existing clusters. THSF supplements clusters with artificial cavities (drilled cavities and insert boxes) when a cluster has fewer than four useable cavities. RCW habitat is prioritized for prescribed burning, with a current fire return interval of approximately every three to five years. As dense, mature pine is thinned, fuel loads and hardwood encroachment are reduced, THSF is moving towards burning these areas every one to three years, including growing season burns. In advance of prescribed burns, THSF prepares RCW

trees by clearing brush around the trees and applying FireIce (water-enhancing gel) to the trunks of the trees. During burns, biologist rangers are present to check burn progress in the vicinity of RCW trees. THSF checks RCW cavity trees for damage during post-burn and wildfire evaluations.

3.1.2 Wood Stork

The wood stork (*Mycteria americana*) is a large wading bird federally and state listed as endangered; the continental breeding population of the wood stork is currently proposed for reclassification from endangered to threatened. Nesting occurs in peninsular and north-central/northeastern Florida, but the western Panhandle does not appear to be a primary area for nesting colonies (USFWS, 2013c). The wood stork does not presently nest on THSF and is considered to only have potential occurrence at the forest. Wood storks feed on small to medium-sized fish, crayfish, amphibians, and reptiles by moving their partially opened bill through water, snapping up prey when the prey comes in contact with the bill (FWC, 2013b). They forage in a variety of wetlands including freshwater and estuarine marshes. Preferred foraging habitats include salt marsh, tidal creeks, mudflats, and small, shallow sloughs that are tributaries to larger tidal creeks. Primary threats to the wood stork include loss of feeding habitat, human manipulation of water levels at nesting sites, predation, and lack of nest tree regeneration.

3.1.3 Reticulated Flatwoods Salamander and Critical Habitat

The reticulated flatwoods salamander (*Ambystoma bishopi*) is state and federally listed as endangered. Based on molecular and morphological analyses, the flatwoods salamander has been separated into two species. The division lies along the Apalachicola-Flint Rivers with reticulated flatwoods salamanders inhabiting areas to the west and frosted flatwoods salamanders (*A. cingulatum*, federally threatened) ranging to the east of the rivers.

Optimal habitat for this small mole salamander is open, mesic (moderately wet) woodlands of longleaf or slash pine flatwoods maintained by frequent fires and that contain shallow, ephemeral wetland ponds. Males and females migrate to these ephemeral ponds during the cool, rainy months of October through December. The females lay their eggs in vegetation at the edges of the ponds. Flatwoods salamanders may disperse long distances from breeding sites to upland sites where they live as adults.

The primary threat to the flatwoods salamander is loss of mesic habitat through the filling in of wetlands and other alterations to the landscape hydrology. Flatwoods salamander habitat is also threatened by the introduction of invasive, non-native species. USFWS guidelines in the Federal Register, dated 1 April 1999, establish a 450-meter (1,476-foot) buffer area from the wetland edge of confirmed breeding ponds. Within the buffer area, the guidelines restrict ground-disturbing activities in order to minimize the potential for direct impacts to salamanders, the introduction and spread of invasive non-native plant species, and alterations to hydrology and water quality. These restrictions also apply to the frosted flatwoods salamander (described below).

Critical habitat has been designated for the reticulated flatwoods salamander on a portion of TA-9 in BRSF (Unit RFS-2 Subunit) (Federal Register, 2009), but the salamander has not been

recently found here by biologists (FDACS and FFS, 2013). The Northwest Florida Water Management District and BRSF share management of a single salamander population within the Subunit, which encompasses 162 acres in Santa Rosa County, Florida (Figure 3-1). Within the unit, there are 32 acres on State land managed by the Water Management District and 130 acres on State land managed by BRSF. This subunit is located south of Interstate 10 and near the Santa Rosa-Okaloosa County border. A road bisects the unit and a power line crosses the eastern edge of the breeding pond. Threats to the reticulated flatwoods salamander and its habitat that may require special management of the primary constituent elements include the potential fire suppression, alterations in forestry practices that could destroy the below-ground soil structure, and hydrologic changes resulting from the road and power line that could alter the ecology of the breeding pond and surrounding terrestrial habitat. In addition, run-off from highways may introduce toxic chemicals into breeding sites.

3.1.4 Frosted Flatwoods Salamander and Critical Habitat

The federally threatened frosted flatwoods salamander (*Ambystoma cingulatum*), similar in appearance to the reticulated flatwoods salamander, occurs in slash and longleaf pine flatwoods that have a wiregrass floor and scattered wetlands. Distribution is east of the Apalachicola River in Franklin, Wakulla, Liberty, Jefferson, and Baker counties. Habitat requirements and breeding behaviors are similar to those described previously for the reticulated flatwoods salamander. The same 450-meter protection buffer also applies for the frosted flatwoods salamander.

There are currently no known ponds on THSF with flatwoods salamanders. Though there are several records of larvae and adult salamanders (1984, 1985, and 1998), more recent surveys have not detected any (2000-2001 drift fence arrays and 2002, 2003, and 2004 dip net surveys). Salamander movement and breeding activity, however, is highly dependent upon weather patterns and several of these surveys were impacted by drought. The small area along the northern boundary of the Sumatra TA-1 tract is considered critical habitat by the USFWS (Figure 3-2); ponds to the north of THSF on Apalachicola National Forest were occupied by flatwoods salamanders as of 2009 and this area of THSF is within the buffer around those ponds. The ponds are part of Unit FFS-1, Subunit A, which is located in Liberty County. Much of the land in this Subunit is owned by the federal government and is likely protected from direct agricultural and urban development. However, the habitat may require special management of the primary constituent elements to address potential threats such as fire suppression, alteration of forestry practices that could destroy the soil structure, and hydrologic changes resulting from adjacent highways and roads that could alter the ecology of the breeding pond and surrounding terrestrial habitat. When potential flatwoods salamander habitat occurs within forest operational areas, buffers will be used to limit further disturbance. The FWC biologist is in the process of identifying ephemeral ponds and other features typical to salamander habitat, though no ponds on THSF are currently known to be occupied. Dip-net surveys will be conducted again in 2014.

3.1.5 Eastern Indigo Snake

The eastern indigo snake (*Drymarchon couperi*) is listed as a federal and state threatened species, and is the largest non-venomous snake in North America. The primary reason for its listing is population decline resulting from habitat loss and fragmentation. Movement along travel corridors between seasonal habitats exposes the snake to danger from increased contact with humans. Indigo snakes frequently utilize gopher tortoise burrows and the burrows of other

species for over-wintering. The snake frequents flatwoods, hammocks, stream bottoms, riparian thickets, and high ground with well-drained, sandy soils.

It is difficult to determine a precise number or even an estimate of the number of these snakes due to the secretive nature of this species. Habitat for this species seems to be good within BRSF; however, the eastern indigo snake has not been found on BRSF for many years (FDACS and FFS, 2013). Occurrence is unknown within THSF, although the *THSF Resource Management Plan* lists the indigo snake as a species potentially inhabiting the area (FDACS, 2007).

3.1.6 Gulf Sturgeon and Critical Habitat

The Gulf sturgeon (*Acipenser oxyrinchus desotoi*) is an anadromous fish with a federal and state status of threatened. This large fish occurs predominately in the northeastern Gulf of Mexico, where it ranges from the Mississippi Delta east to the Suwannee River in Florida. The Gulf sturgeon feeds in offshore areas and inland bays during the winter months and moves into freshwater rivers during the spring to spawn. Migration into fresh water generally occurs from March to May, with spawning taking place during April through June. Migration into salt water begins in late October to early November.

In the Final Rule for the designation of critical habitat, seven primary constituent elements are identified (Federal Register, 2003):

- Abundant food items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats for adult and subadult life stages.
- Riverine spawning sites with suitable substrate.
- Riverine aggregation areas (resting, holding, or staging areas).
- Proper stream flow regime for all life stages.
- Adequate water quality for all life stages.
- Adequate sediment quality for all life stages.
- Safe and unobstructed migratory pathways for passage within and between riverine, estuarine, and marine habitats.

Critical habitat units for the Gulf sturgeon collectively encompass almost 2,800 river kilometers and over 6,000 square kilometers of estuarine and marine habitat. In the region of GLI activities, critical habitat is delineated for the 1) Yellow River and its tributaries, 2) Blackwater River downstream from its confluence with Big Coldwater Creek, 3) Apalachicola River and its tributaries, 4) Apalachicola Bay and its adjoining bays, sounds, and nearshore waters of the Gulf of Mexico, and 5) the Gulf of Mexico from the Mean High Water line to 1 nautical mile offshore (Figure 3-1 and Figure 3-2).

3.1.7 Piping Plover and Critical Habitat

The piping plover (*Charadrius melodus*) is a federally and state threatened bird. Non-breeding (migration and wintering) piping plover season along the Gulf Coast is

15 July through 15 May. Piping plovers migrate to northern areas to breed. In Gulf Coast areas, piping plovers are known to forage for invertebrates in exposed wet sand such as wash zones, intertidal ocean beachfronts, wrack lines, washover passes, mud and sand flats, ephemeral ponds, and salt marshes. They are also known to use adjacent areas for sheltering in dunes, debris, and sparse vegetation. Studies have shown that non-breeding plovers spend 76 percent of their time foraging for invertebrates found just below the surface of wet sand (U.S. Air Force, 2013). Piping plovers are commonly documented during winter in the Florida panhandle with highest numbers of birds occurring in Franklin, Gulf, and Bay counties.

Piping plover critical habitat generally includes land from the Mean Lower Low Water (MLLW) line to where densely vegetated habitat, not used by the piping plover, begins and where the constituent elements no longer occur (Federal Register, 2001). At THSF, critical habitat for the wintering piping plover is present in FL-10 Unit, Yent Bayou, most of which is adjacent to the area known as Royal Bluff (Figure 3-2). The unit includes the St. George shoreline between 3.7 miles and 5.9 miles east of State Road 65, and encompasses the area from MLLW to where the constituent elements are no longer present (i.e., developed structures, roads, or densely vegetated habitat). The area is not posted because this portion of THSF is not easily accessible and there is little human traffic.

3.1.8 Purple Bankclimber and Critical Habitat

The purple bankclimber (*Elliptoides sloatianus*) is a large freshwater mussel federally and state listed as threatened. This species occurs in rivers of the central Florida Panhandle and southwestern Georgia with slow to moderate current and sand, fine gravel, or muddy sand substrate (FWC, 2013a; NatureServe, 2013). Little is known of this mussel's life history. As a filter feeder, diet consists primarily of plankton and detritus. Larvae are released into the water and attach to the gills or fins of host fish, where they develop and then release to settle on the substrate. Mosquito fish, black-banded darter, and the guppy are thought to be host fish (NatureServe, 2013). The primary threat to the purple bankclimber is waterway impoundment, which may result in sedimentation due to decreased water velocity. Impoundment may also cause habitat fragmentation, potentially leading to a lack of or diminished numbers of host fish. Other threats include river dredging, competition with invasive species, and pesticide and chemical pollution.

Critical habitat has been designated for the purple bankclimber in portions of the Apalachicola and Ochlocknee Rivers (USFWS, 2007a) (Figure 3-2). Portions of the Lower Ochlocknee River segment occur adjacent to THSF. This segment consists of the main channel from its confluence with Syfrett Creek in Wakulla County, Florida, upstream to the Jackson Bluff Dam in Leon and Liberty Counties. The primary constituent elements used to define critical habitat, and which are present in each river or river segment, include 1) a geographically stable stream channel, 2) predominantly sand/gravel/cobble substrate with low to moderate amounts of silt and clay, 3) permanently flowing water, 4) adequate water quality, and 5) presence of host fish.

3.1.9 Choctaw Bean, Narrow Pigtoe, Southern Sandshell, Fuzzy Pigtoe and Critical Habitat

The Choctaw bean (*Villosa choctawensis*), narrow pigtoe (*Fusconaia escambia*), southern sandshell (*Hamiota australis*), and fuzzy pigtoe (*Pleurobema strodeanum*) are freshwater mussel

species that are listed as endangered (Choctaw bean) or threatened (remaining species) under the ESA (Federal Register, 2012). As filter feeders, these species live as adults embedded in the bottom of water bodies, collecting and ingesting detritus, algae, and bacteria. Juveniles burrow completely into the substrate and collect food with the extended foot. Like the purple bankclimber, larvae are released into the water and attach to the gills, fins, or skin of host fish, where they develop and then release. These mussels are endemic to three Coastal Plain rivers – Escambia/Concuh, Yellow, and Choctawhatchee Rivers, thus may occur at BRSF (Figure 3-1).

The Choctaw bean occurs in all three river drainages. The species is generally found in medium creeks to medium rivers in stable substrates of silty sand to sandy clay with moderate current. This mussel persists in most of its historic range. However, it has experienced localized extirpations and population numbers are low, particularly in the Escambia and Yellow River drainages. For example, a total of only 14 and 15 individuals have been collected in Escambia and Yellow River drainages, respectively, since 1995.

The narrow pigtoe is known from the Escambia and Yellow River drainages in Florida. The species is found in medium creeks to medium rivers, in stable substrates of sand, sand and gravel, or silty sand, with slow to moderate current. It occurs in nearly all its historical range of the Escambia River drainage, but is rare in the Yellow River drainage.

The southern sandshell is known from the Escambia River drainage in Alabama, and the Yellow and Choctawhatchee River drainages in Alabama and Florida. This species is typically found in small creeks and rivers in stable substrates of sand or mixtures of sand and fine gravel, with slow to moderate current. The southern sandshell persists throughout its historic range; however, the range is fragmented and numbers appear to be declining.

The fuzzy pigtoe is endemic to the Escambia, Yellow, and Choctawhatchee River drainages. The species is found in medium creeks to medium rivers in stable substrates of sand and silty sand with slow to moderate current. Present occurrence in the Escambia River drainage is uncertain. It is considered exceedingly rare in the Yellow River drainage, where only a single individual has been collected from the main channel in Florida in recent years. The fuzzy pigtoe occurs in nearly all its historic range of the Choctawhatchee River drainage, although it has become extirpated in localized areas.

Like other freshwater mussels, the primary threat to these species is habitat modification and destruction, particularly sedimentation, dam placement, and water quality degradation. Critical habitat has been designated for these four species, and consists of nine units within the various river drainages. Designated critical habitat includes the creek and river channels within the ordinary high-water line, which is considered to be the line on the shore established by water fluctuations. Critical habitat for the four species described above occurs in the Yellow River system along the border of BRSF (Figure 3-1).

3.1.10 Godfrey's Butterwort

Godfrey's butterwort (*Pinguicula ionantha*) is a carnivorous plant species federally listed as threatened and state listed as endangered. This species is only known to occur in six counties of the Florida Panhandle, including Franklin and Liberty Counties (USFWS, 2013). Typical habitat

includes open, acidic soils of seepage bogs on gentle slopes, deep quagmire bogs, ditches, and depressions in grassy pine flatwoods and grassy savannas (NatureServe, 2013a). The species often occurs in shallow standing water and some leaves may be submerged. Occurrence has also historically been noted along road right-of-ways. Primary threats include fire suppression and habitat alteration. Fire suppression may result in increased growth of shrubs and saplings in the understory, which inhibits the butterwort. Eleven populations were previously reported in THSF (Figure 3-3); however, only four populations were found during a survey in 2009 (USFWS, 2009).

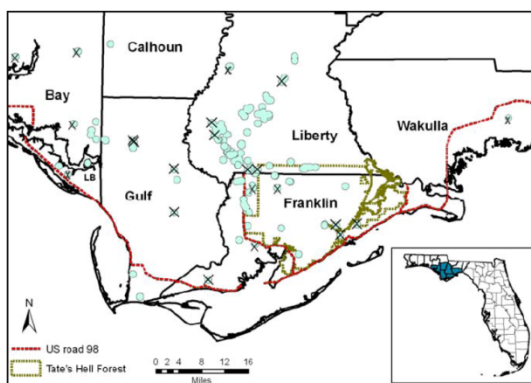


Figure 3-3. Godfrey's Butterwort Documented Occurrences

Source: USFWS, 2009; X = not found during recent surveys

3.1.11 Florida Skullcap

The Florida skullcap (*Scutellaria floridana*) is a perennial plant species federally listed as threatened and state listed as endangered. The skullcap is known from only four counties of the Florida Panhandle, including Franklin and Liberty Counties (USFWS, 2013a). This species typically occurs in poorly drained coastal pinelands with frequent fire (U.S. Forest Service, 2010). Habitat generally includes grassy wet flatwoods, wet prairies, and savannas; palustrine habitats consist of various wetland types (forested, herbaceous, and scrub-shrub) (NatureServe, 2013b; FNAI, 2010). Three known populations have been documented in the western portion of THSF, with other populations near the northern border (Figure 3-4) (USFWS, 2009a); one of the three populations was not found during a 2008 survey. The missing population occurred in an area historically fire suppressed and disturbed by feral hogs. Fire suppression is one of the primary threats to this plant. Frequent fire stimulates the emergence of individuals and maintains stable populations.

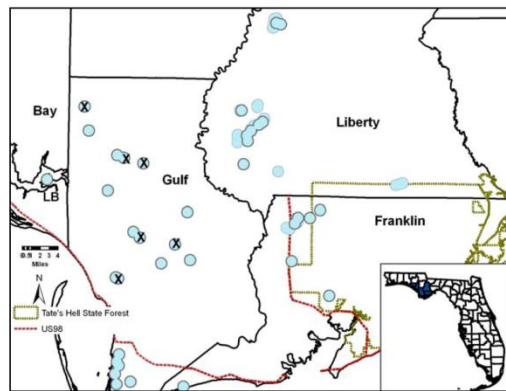


Figure 3-4. Florida Skullcap Documented Occurrences

Source: USFWS, 2009a; X = not found during recent surveys

3.1.12 White Birds-in-a-nest

The white birds-in-a-nest (*Macbridea alba*) is a plant species federally listed as threatened and state listed as endangered. This species is restricted to four counties of the Florida Panhandle, including Franklin and Liberty Counties (USFWS, 2013b). Occurrence is typically in grassy areas of poorly drained soil; the wettest sites are grassy seepage bogs on gentle slopes at the edges of forested or shrubby wetlands (Federal Register, 1990). Less permanently wet sites include savannas and wet prairies. The species may occasionally be found on drier sites with longleaf pines and oaks (NatureServe, 2013c). White birds-in-a-nest require fire to maintain healthy populations. This species is found near the eastern and western borders of THSF (Figure 3-5). Six populations were previously documented at THSF (USFWS, 2009b). About 21 plants were recorded at 3 of these sites during surveys in 2008; of the two remaining sites, one was not found and one did not contain the species.

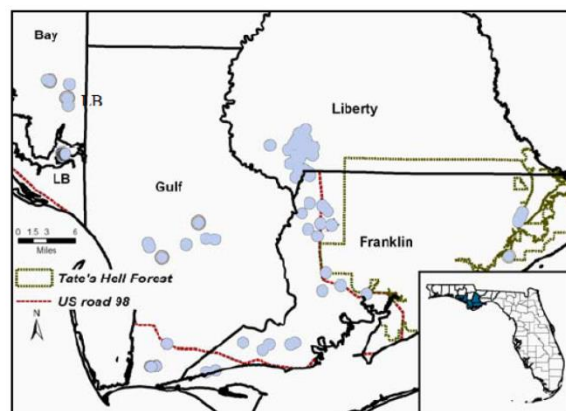


Figure 3-5. White Birds-in-a-Nest Documented Occurrences

Source: USFWS, 2009b

3.1.13 Telephus Spurge

Telephus spurge (*Euphorbia telephioides*) is a federally threatened plant species that is known from only three Florida counties (Bay, Franklin, and Gulf). Habitat generally consists of 1) longleaf and slash pine savanna/flatwoods with ground cover dominated by wiregrass, and 2) low, sandy rises dominated by pine/scrub oak near the coast (NatureServe, 2013f). Historically documented populations are shown in the 5-year review of this species (USFWS, 2008a). In Franklin County, two of these populations (numbers 26 and 35) are depicted near THSF (Figure 3-6). However, no specimens were found at either of these sites during a 2007 survey and the review document states that both populations may be extirpated. Nevertheless, the USFWS considers this species to have potential occurrence in THSF.

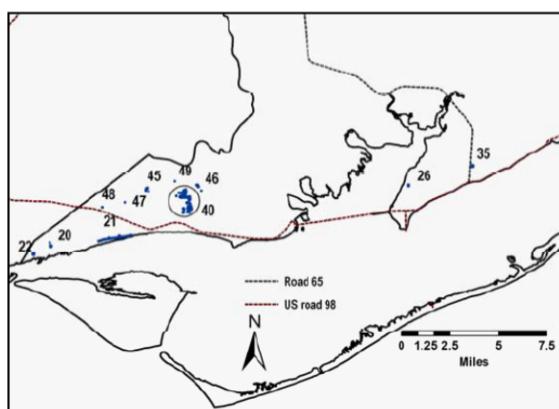


Figure 3-6. Telephus Spurge Documented Occurrences

Source: USFWS, 2008a

3.2 OTHER SPECIES CONSIDERED

3.2.1 Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*) is a state threatened species, and a federal candidate species, that is found on both BRSF and THSF. A Federal Register (2011a) notice documented the 12-month finding on a petition to list the gopher tortoise as threatened in the eastern portion of its range (east of the Mobile and Tombigbee Rivers). The review found that the listing of the gopher tortoise is warranted; however, listing is currently precluded by higher priority actions. The gopher tortoise is currently classified as a Candidate species, and a proposed rule to list the gopher tortoise will be developed as priorities allow. In December 2008, all Department of Defense entities, as well as state agencies and other non-governmental organizations, signed a Candidate Conservation Agreement with the USFWS. This agreement defines what each agency will voluntarily do to conserve the gopher tortoise and its habitat.

In the GLI region, the gopher tortoise is found primarily in longleaf pine and oak uplands (sandhills) and open grassland ecological associations, where it excavates a tunnel-like burrow

for shelter from climatic extremes and refuge from predators. The primary features of good tortoise habitat are well-drained sandy soils, open canopy with plenty of sunlight, and abundant food plants (forbs and grasses). Prescribed fire is often employed to maintain these conditions. Nesting occurs during May and June and hatching occurs from August through September. Gopher tortoise burrows serve as important habitat for many species, including the federally listed eastern indigo snake.

3.2.2 Federally Petitioned Species

In 2011, the USFWS announced a finding on a petition to list over 400 plant and animal species occurring in the southeastern U.S. as endangered or threatened under the ESA (USFWS, 2011). The Service found that there is substantial scientific or commercial information indicating that listing may be warranted for 374 of the species. Therefore, a status review of these species is currently in progress. Five of the animal species and eight of the plant species for which listing is considered warranted have potential occurrence in BRSF or THSF (Table 3-2 and Table 3-3).

Table 3-2. Federally Petitioned Animal Species at THSF and BRSF

Common Name	Scientific Name	Classification	BRSF	THSF
Westfall's clubtail	<i>Gomphus westfalli</i>	Insect	X	
One-toed amphiuma	<i>Amphiuma pholeter</i>	Amphibian	X	X
Barbour's map turtle	<i>Graptemys barbouri</i>	Reptile		X
Escambia map turtle	<i>Graptemys ernsti</i>	Reptile	X	
Florida red-bellied turtle	<i>Pseudemys nelsoni</i> pop. 1	Reptile		X

The Westfall's clubtail is a dragonfly species that has an extremely small known range of about 25 kilometers diameter in the Florida Panhandle, and has been documented only within a few streams on BRSF in Santa Rosa County (NatureServe, 2013d). Larval habitat for this species generally consists of boggy streams and seepages, where larvae burrow in silt. Adults forage in open forest near ground level, with an estimated range of approximately 500 meters in a radius around the breeding site (NatureServe, 2013d).

The one-toed amphiuma is a salamander that occurs only within about 80 to 120 kilometers inland from the southeastern Gulf coast (NatureServe, 2013g). This species has potential occurrence within BRSF and THSF. Habitat consists of riparian areas and various wetland types (forested, scrub-shrub, floodplain swamp). Alluvial forest, which consists of hardwood forest on low levees, ridges and terraces within the floodplains of streams and rivers, constitutes known habitat for this species (FNAI, 2009).

Barbour's map turtle occurs primarily in the Apalachicola River system, including Franklin County, Florida (NatureServe, 2013h), and may occur at THSF. Although this species has not been recorded at THSF, surveys for this species will continue in the spring of 2014. This species may be found in wetland, riparian, and sandy areas. Habitat includes alluvial and spring-fed rivers and associated waters (river swamps, impoundments, etc.), as well as clear limestone-bottomed streams with an abundance of fallen trees and mollusks. This turtle is often found basking on logs. It is inactive at night and may be found on submerged limbs just beneath the water surface. During cold weather, it often rests on the bottom in limestone depressions. Eggs are buried in sand at the water's edge. Adult males and juveniles feed mostly on insects, while adult females feed primarily on mussels and snails.

The Escambia map turtle occurs in several river drainages of northwest Florida and Alabama, including the Yellow and Shoal Rivers (NatureServe, 2013i), and may occur in BRSF. This species may be found in riparian and sandy areas. Habitat includes rivers with alluvial characteristics more prominent than blackwater characteristics. This turtle is frequently found in small streams but reaches greater abundance in large rivers with abundant basking and nesting sites (beaches with fine sands). The species is absent from rivers that lack freshwater mollusks (e.g., Blackwater River, Florida). It avoids salt water and is therefore rarely found within one mile of a river mouth. Diet is similar to the Barbour's map turtle.

The Florida red-bellied turtle (population 1 – Florida Panhandle) is apparently limited to the lower Apalachicola/Chipola River drainage and associated delta and offshore islands (NatureServe, 2013j). This population is disjunct from the main population in peninsular Florida. This species has been recorded in Franklin County, although none have been found in THSF. Habitat consists of ponds, lakes, and sluggish portions of rivers. Nesting occurs in adjacent upland habitat, typically in sunny locations, and potentially in alligator nests. This species often burrows in the soil.

Table 3-3 lists the petitioned plant species that occur at BRSF and THSF, and includes summary habitat descriptions.

Table 3-3. Federally Petitioned Plant Species at BRSF and THSF

Common Name	Scientific Name	Locations	Habitat*
West's flax	<i>Linum westii</i>	THSF	Shallow pond margins in slash pine-saw palmetto flatwoods, bogs, cypress pond margins, and ditches. Depression marshes, dome swamps, wet flatwoods, and wet prairies.
Curtiss' loosestrife	<i>Lythrum curtissii</i>	THSF	Silts, fine sands, or peat mucks of bogs, seeps, and clearings found in or on edges of acid or calcareous swamps, karst ponds, creek swamps, floodplains, and stream banks.
Bear tupelo	<i>Nyssa ursina</i>	THSF	Open bogs, wet flatwoods, and swamps, often with titi.
Small-flower meadow-beauty	<i>Rhexia parviflora</i>	BRSF; THSF	Margins of ponds and shallow depressions associated with pine-palmetto flatwoods and savannas. Found on seepage slopes and margins of dome swamps, depression marshes, and evergreen shrub ponds. Soils are usually sands with high peat content.
Henry's spider-lily	<i>Hymenocallis henryae</i>	THSF	Occurs within the narrow ecotone between dome swamps and mesic/wet flatwoods, or within the ecotone between dome swamps and wet prairies.
Panhandle lily	<i>Lilium iridollae</i>	BRSF	Baygalls, wet flatwoods, seepage slopes, and the edges of bottomland forests, typically in sandy peat or loamy soils which are saturated for at least part of the year. The sites have open to full sun or filtered light. Occasional fire is advantageous to this species.
Gulf sweet pitcher plant	<i>Sarracenia rubra</i> sp. <i>gulfensis</i>	BRSF	Sandy-muck spring-head bogs, often bordering small ponds or slow meandering creeks and rivers. The most robust plants grow in areas not subject to seasonal drying and receiving nearly daylong open light or only partially shaded.

Source: NatureServe, 2013e

3.2.3 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is protected by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Eagles are territorial and exhibit a strong affinity for a nest site once a nest has been established. It is common for a breeding pair to rebuild damaged or lost nests in the same tree or in an adjacent tree. Individual pairs return to the same territory year after year and territories are often inherited by subsequent generations. The nesting period in the southeast United States extends from 01 October to 15 May with most nests completed by the end of November (U.S. Air Force, 2013). Most eagles migrate north during the summer season. In northwest Florida, most successful nests are completed by mid-February. The quality and amount of forage resources, mainly fish and carrion, heavily influence fledgling survival. Typical habitat includes forested areas near water bodies (fresh, estuarine, and marine). Bald eagle occurrence and nesting activity have been documented on BRSF and THSF (FDACS and FFS, 2013; FDACS, 2007).

3.2.4 State Listed Animal Species

All state listed animal species that occur within or adjacent to BRSF and/or THSF are listed in Table 3-4, along with the area of expected occurrence and a brief habitat description. Some of these state listed species are also federally protected.

Table 3-4. State Listed Animal Species at BRSF and THSF

Common Name	Scientific Name	Status	Locations	Habitat
Amphibians				
Reticulated flatwoods salamander	<i>Ambystoma bishopi</i>	E/FE	BRSF	Slash and longleaf pine flatwoods with a wiregrass floor and scattered wetlands.
Frosted flatwoods salamander	<i>Ambystoma cingulatum</i>	T/FT	THSF	Slash and longleaf pine flatwoods with a wiregrass floor and scattered wetlands.
Pine barrens tree frog	<i>Hyla andersonii</i>	SSC	BRSF	Seepage bog pools, which are acidic water pools with decayed vegetation caused by a subsurface water table or accumulated precipitation.
Gopher frog	<i>Rana capito</i>	SSC	BRSF, THSF	Mostly longleaf pine, xeric oak, and sandhills, but also occurs in upland pine forest, scrub, xeric hammock, mesic and scrubby flatwoods, dry prairie, mixed hardwood-pine communities, and a variety of disturbed habitats. May inhabit gopher tortoise burrows.
Florida bog frog	<i>Rana okaloosae</i>	SSC	BRSF	Diverse aquatic areas including shallow, acidic spring seeps; boggy overflows of larger seepage streams; sluggish bends in streams; and pond edges. The dominant vegetation in these habitats includes black titi, sweetbay magnolia, Atlantic white cedar, swamp titi, and blackgum.
One-toed amphiuma	<i>Amphiuma pholeter</i>	N/FP	BRSF, THSF	Riparian areas, forested wetlands, floodplain swamp, and alluvial forests
Reptiles				
Eastern indigo snake	<i>Drymarchon couperi</i>	T/FT	BRSF, THSF	Pine flatwoods, hardwood forests, moist hammocks, and areas surrounding cypress swamps.
Gopher tortoise	<i>Gopherus</i>	T/FC	BRSF	High, dry, sandy habitats such as longleaf pine-

	<i>polyphemus</i>		THSF	xeric oak sandhills; also be found in scrub, dry hammocks, pine flatwoods, dry prairies, coastal grasslands and dunes, mixed hardwood-pine communities, and a variety of disturbed habitats such as pastures.
Alligator snapping turtle	<i>Macrochelys temminckii</i>	SSC	BRSF, THSF	Rivers, lakes, backwater swamps, and periodically in brackish water systems.
Barbours map turtle	<i>Graptemys barbouri</i>	SSC/FP	THSF	Rapid flowing waters, primarily in mainstream channels of alluvial rivers and spring-fed streams
Escambia map turtle	<i>Graptemys ernsti</i>	N/FP	BRSF	Alluvial rivers and streams; riparian and sandy areas
Florida red-bellied turtle	<i>Pseudemys nelson pop. 1</i>	N/FP	THSF	Ponds, lakes, and sluggish portions of rivers and their adjacent habitats
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	SSC	BRSF	Areas with well-drained sandy soils and moderate to open canopy. Vegetation communities include longleaf pine/turkey oak, sand pine scrub, pine flatwoods on well-drained soils, xeric hammocks, and old fields on former sandhill sites. May use open habitats around wetlands during drought. Uses gopher tortoise burrows.
American alligator	<i>Alligator mississippiensis</i>	T/FT*	THSF	Freshwater lakes, slow moving rivers, and brackish water habitats.
Mammals				
Sherman's fox squirrel	<i>Sciurus niger shermani</i>	SSC	BRSF, THSF	Open, fire-maintained longleaf pine, turkey oak, sandhills, and flatwoods. Best habitat contains both pines and oaks.
Eastern chipmunk	<i>Tamias striatus</i>	SSC	BRSF	Deciduous forests and hardwood or mixed hardwood-pine forests. Also shrubland.
Florida mouse	<i>Peromyscus floridanus</i>	SSC	THSF	Fire-maintained, xeric, upland vegetation on well-drained sandy soils, including longleaf pine-turkey oak (sandhill), sand pine scrub, coastal scrub, scrubby flatwoods, upland hammock, live oak (xeric) hammock, and drier pine flatwoods.
Florida black bear	<i>Ursus americanus floridanus</i>	FBBCR	BRSF, THSF	A variety of undeveloped forested communities, often in areas of dense cover, including pine flatwoods, titi swamp, hardwood swamp, cypress swamp, cabbage palm forest, sand pine scrub, and mixed hardwood hammock. Usually in areas that include multiple forest types.
Fish				
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	T/FT	BRSF, THSF	Brackish and salt water during from fall (late October) through winter. In the spring (March), migrate into fresh water rivers and remain there through the summer months.
Bluenose shiner	<i>Pteronotropis welaka</i>	SSC	BRSF	River swamps, backwaters, spring-run streams; areas of aquatic vegetation and in deep pools.
Blackmouth shiner	<i>Notropis melanostomus</i>	T	BRSF	Backwaters of streams and rivers.
Birds				
Red-cockaded woodpecker	<i>Picoides borealis</i>	E/FE	BRSF, THSF	Longleaf, slash, and loblolly pine ecosystems.
Wood stork	<i>Mycteria americana</i>	E/FE	THSF	Mixed hardwood swamps, sloughs, mangroves, and cypress domes/strands. Forage in a variety of wetlands including freshwater and estuarine marshes, limited to depths less than 10-12 inches.
Piping plover	<i>Charadrius</i>	T/FT	THSF	Sandy beaches, sand flats, and mudflats along

January 2014

Biological Assessment for GRASI Landscape Initiative Training Areas
Eglin Air Force Base, FL

Page 3-17

	<i>melodus</i>			coastal areas.
Bald eagle	<i>Haliaeetus leucocephalus</i>	BGEPA	BRSF, THSF	Conifer or hardwood forest, usually close to fresh, estuarine, or marine water bodies supporting occurrence primary food sources including fish, waterfowl, or seabirds. Standing snags or hollow trees may be particularly utilized.
Scott's seaside sparrow	<i>Ammodramus maritimus peninsulae</i>	SSC	THSF	Tidal marshes.
Limpkin	<i>Aramus guarauna</i>	SSC	THSF	Shallows along rivers, streams, lakes, and in marshes, swamps and sloughs.
Little blue heron	<i>Egretta caerulea</i>	SSC	THSF	Fresh, salt, and brackish water environments including swamps, estuaries, ponds, lakes, and rivers.
Reddish egret	<i>Egretta rufescens</i>	SSC	THSF	Coastal areas, including bay/sound, herbaceous wetland, lagoon, river mouth/tidal river, scrub-shrub wetland, and tidal flat/shore.
Snowy egret	<i>Egretta thula</i>	SSC	THSF	Shallow estuarine areas including mangroves, shallow bays, salt marsh pools, and tidal channels.
Tricolored heron	<i>Egretta tricolor</i>	SSC	THSF	Fresh and saltwater marshes, estuaries, mangrove swamps, lagoons, and river deltas.
White ibis	<i>Eudocimus albus</i>	SSC	THSF	Various salt water and freshwater habitats including marshes, mangroves, lagoons, lakes, marsh prairie, pasture, coastal swamps, and other wetland types.
Southeastern American kestrel	<i>Falco sparverius paulus</i>	T	THSF	Open woodlands, sandhill, and fire-maintained savannah pine habitats. Will also use alternative habitats including pastures and open fields of residential areas.
Osprey	<i>Pandion haliaetus</i>	SSC	THSF	Coastal areas, lakes, rivers, and swamps.
Invertebrates				
Purple bankclimber	<i>Elliptioideus sloatianus</i>	T/FT	THSF	Slow to moderate current rivers with a sandy floor, possibly with a mud or gravel mixture.
Choctaw bean	<i>Villosa choctawensis</i>	N/FE	BRSF	Large creeks and rivers with moderate current over sand to silty-sand substrates.
Narrow pigtoe	<i>Fusconaia escambia</i>	N/FT	BRSF	Channels of small to medium-sized streams in sand, silty sand, or gravel and in muddy sand in slight current. May also occur in smaller streams and silty backwater areas.
Southern sandshell	<i>Hamiota australis</i>	N/FT	BRSF	Clear, medium-sized creeks to rivers with slow to moderate current and sandy substrates.
Fuzzy pigtoe	<i>Pleurobema strodeanum</i>	N/FT	BRSF	Medium-sized creeks and rivers, in sand and silty sand substrates with slow to moderate current.
Westfall's clubtail	<i>Gomphus westfalli</i>	N/FP	BRSF	Boggy streams and seepages. Larvae burrow in silt, adults forage in open forest near ground level.

Sources: FWC, 2013e; NatureServe, 2013e, *FT due to similarity of appearance

BGEPA = Bald and Golden Eagle Protection Act; BRSF = Blackwater River State Forest; E = State Endangered; FBCR = Florida Black Bear Conservation Rule; FC = Federal Candidate; FE = Federal Endangered; FP = Federal Petitioned; FT = Federally Threatened; N = No State Listing; SSC = State Species of Special Concern; T = State Threatened; THSF = Tate's Hell State Forest

3.2.5 State Listed Plant Species

In addition to the four federally listed plant species described above, 38 state listed plant species occur within BRSF and/or THSF. These species are listed in Table 3-5, which includes a designation of upland or wetland habitat type.

Table 3-5. State Listed Plant Species at BRSF and THSF

Common Name	Scientific Name	Status	Location	Habitat	
				Upland	Wetland*
Hairy wild indigo	<i>Baptisia calycosa</i> var. <i>villosa</i>	T	BRSF	X	
Sweet shrub	<i>Calycanthus floridus</i>	E	BRSF	X	
Piedmont jointgrass	<i>Coelorachis tuberosa</i>	T	BRSF		X
Spoon-leaved sundew	<i>Drosera intermedia</i>	T	BRSF, THSF		X
Trailing arbutus	<i>Epigaea repens</i>	E	BRSF	X	
Dwarf witch alder	<i>Fothergilla gardenii</i>	E	BRSF		X
Mountain laurel	<i>Kalmia latifolia</i>	T	BRSF		X
Bog button	<i>Lachnocaulon digynum</i>	T	BRSF		X
Panhandle lily	<i>Lilium iridollae</i>	E	BRSF		X
Hummingbird flower	<i>Macranthera flammula</i>	E	BRSF, THSF		X
Primrose-flowered butterwort	<i>Pinguicula primuliflora</i>	E	BRSF		X
Little club-spur orchid	<i>Platanthera clavellata</i>	E	BRSF		X
Yellow fringeless orchid	<i>Platanthera integra</i>	E	BRSF		X
Giant orchid	<i>Pteroglossaspis cristata</i>	T	BRSF	X	
Arkansas oak	<i>Quercus arkansana</i>	T	BRSF	X	
Small-flowered meadowbeauty	<i>Rhexia parviflora</i>	E	BRSF, THSF		X
Florida flame azalea	<i>Rhododendron austrinum</i>	E	BRSF	X	
Hairy-peduncled beaksedge	<i>Rhynchospora crinipes</i>	E	BRSF		X
White-top pitcher plant	<i>Sarracenia leucophylla</i>	E	BRSF, THSF		X
Sweet pitcher plant	<i>Sarracenia rubra</i>	T	BRSF		X
Harper's yellow-eyed grass	<i>Xyris scabrifolia</i>	T	BRSF		X
Narrow-leaved bluestem	<i>Andropogon arctatus</i>	T	THSF	X	
Southern milkweed	<i>Asclepias viridula</i>	T	THSF		X
Scareweed	<i>Baptisia simplicifolia</i>	T	THSF	X	
Wiregrass gentian	<i>Gentiana pennsylvanica</i>	E	THSF		X
Henry's spider lily	<i>Hymenocallis henryae</i>	E	THSF		X
Water willow	<i>Justicia crassifolia</i>	E	THSF		X
Godfrey's blazing star	<i>Liatris provincialis</i>	E	THSF	X	
West's flax	<i>Linum westii</i>	E	THSF		X
Gulf coast lupine	<i>Lupinus westianus</i>	T	THSF	X	
Curtiss loosestrife	<i>Lythrum curtissii</i>	E	THSF		X
White birds-in-a-nest	<i>Machiridea alba</i>	E/FT	THSF		X
Florida beargrass	<i>Nolina atopocarpa</i>	T	THSF	X	
Carolina grass-of-parnassus	<i>Parnassia caroliniana</i>	E	THSF		X
Pinewood false sunflower	<i>Phoebeanthus tenuifolia</i>	T	THSF	X	
Apalachicola dragonhead	<i>Physostegia godfreyi</i>	T	THSF		X
Godfrey's butterwort	<i>Pinguicula ionantha</i>	E/FT	THSF		X
Large-leaved jointweed	<i>Polygonella macrophylla</i>	T	THSF	X	
Narrow-leaved beakrush	<i>Rhynchospora stenophylla</i>	T	THSF		X
Night flowering pectunia	<i>Ruellia noctiflora</i>	E	THSF		X
Florida skullcap	<i>Scutellaria floridana</i>	E/FT	THSF		X

Source: USF, 2013; *Designated Facultative Wetland and/or Obligate Wetland; BRSF = Blackwater River State Forest; E = State Endangered; FT = Federally Threatened; T = State Threatened; THSF = Tate's Hell State Forest

4. EFFECTS DETERMINATION

This section discusses potential impacts to protected species located within and adjacent to the action area. Analysis focuses on assessing the potential for impacts from GLI training activities, and on identifying methods to reduce the potential for negative impacts to protected species from these activities.

Impact Categories

Based on the scope of the Proposed Action, potential impacts to sensitive species from implementing training activities can be categorized as follows:

- **Direct Physical Impacts**—Physical harm (i.e., injury or mortality) to listed species as a result of human activities. The main cause of direct physical impacts associated with the Proposed Action is physical contact, which could involve the crushing/trampling of, or collision with, a species due to vehicle traffic or human movements resulting in physical damage or mortality of a species.
- **Harassment**—Actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Activities under the Proposed Action may result in harassment due to the following:
 - **Foraging/nesting disturbance**—Disruption of normal breeding/nesting or foraging activity.
 - **Nest/burrow destruction**—Destruction of a nest or burrow due to excessive ground disturbance, causing a species to relocate.
- **Habitat Impacts**—Habitat impacts include loss, alteration, and/or degradation of habitat. These impacts characterize the physical damage, stress, or disruptions that may adversely alter or degrade the habitats essential to the sustainment of a species. A habitat in this instance refers to the ecological and geomorphological components, such as vegetation, soil, topography, and water that support listed species. Activities under the Proposed Action may result in habitat impacts due to the following:
 - **Soil erosion**—Loss of soil due to ground disturbing activities occurring in or near sensitive species habitat resulting in habitat loss, alteration, or degradation.
 - **Sensitive habitat degradation**—Degradation or destruction of sensitive habitats such as wetland areas or foraging habitat resulting from human activities (i.e., driving, wildfires) having a negative impact.

Effector Categories

This section utilizes the six effector categories below for analysis. These effector categories are the primary types of activities with the potential for impacts to sensitive species. Table 4-1 identifies the effector categories that apply for each Proposed Action component.

Land Disturbance – entails actions associated with changing the landscape through the disturbance of natural resources, including land clearing/construction, small-scale point impacts (bivouac), incidental surface disturbance, and direct consumption of plants or animals.

Ground Movement – involves the movement of troops (dismounted movement) and wheeled vehicles (i.e., trucks, ATVs) across the training environment.

Expendables and Equipment Usage – associated with utilization of munitions, pyrotechnics, and/or equipment in support of training activities, including blanks, ground burst simulators (GBSs), smoke grenades, simulated munitions, equipment (i.e., generators), and fuel.

Aircraft Operations – involves the use of fixed wing and/or rotary wing aircraft as part of a training activity.

Amphibious Operations – associated with activities in which the main goal is to interact with, and conduct training within, water resources (boating, shoreline interactions, etc.).

Electromagnetic Radiation (EMR) – associated with the use of radar emitters.

4.1 FEDERALLY LISTED SPECIES

This section discusses potential impacts to federally listed species from training activities conducted at BRSF, THSF, and emitter sites. Analyses focus on the potential for impacts from land disturbance, ground movement, expendables and equipment usage, aircraft operations, amphibious operations, and electromagnetic radiation. Impact assessments were made with the understanding that the Conservation Measures in Section 2.3 would be implemented as part of the Proposed Action, thus minimizing or eliminating negative impacts to some sensitive species.

4.1.1 Red-cockaded Woodpecker

RCWs may be impacted by noise and human presence associated with land disturbance, ground movements, and aircraft operations, and noise and wildfires from expendables use. To ensure active RCW trees are identified and protected, Eglin will delineate specific training areas and corridors prior to ground operations to allow for RCW surveys and tree marking. Additionally, THSF and BRSF will continue to implement RCW management activities as detailed in their most current *RCW Operations Plans* and *RCW Five-year Management Plans*.

Table 4-1. Proposed Action Effectors

Proposed Action Component	Effector Category					
	Land Disturbance	Ground Movement	Expendables /Equipment	Aircraft Ops	Amphibious Ops	EMR
Emitter Sites	•	•				•
Establishment of HLZs/DZs	•					
Establishment of Airstrips	•					
Use of Expendables			•			
Light Aviation Proficiency Training	•	•	•	•		
Low-Level Helicopter Insertions/ Extractions	•	•	•	•		
Temporary Combat Support Areas	•	•	•			
Airdrops	•	•	•	•		
Air/Land Vertical Lift	•	•	•	•		
FARP/HGO	•	•	•	•		
Cross-Country Dismounted Movements	•	•	•			
Cross-Country Vehicle Movement	•	•	•			
Vehicle Stream and Wetland Crossing	•	•				
Blackout Driving	•	•				
Emplacement of Obstacles	•	•				
Bivouacking/ Assembly Areas	•	•	•			
Communication and Surveillance Operations	•	•	•			
Amphibious Operations	•	•	•		•	
Natural Resource Consumption	•	•				
Overwater Hoist Operations		•		•	•	
Opposing Forces Vehicle Operations	•	•	•	•		
Hardened Camp Site Use	•	•	•			

DZ = drop zone; EMR = electromagnetic radiation; FARP = forward air refueling point; HGO = hot gas operations; HLZ = helicopter landing zone

Land Disturbance

Noise and human presence associated with land disturbing activities (i.e., road widening) could disrupt RCW feeding, breeding, and nesting activities. However, noise impacts would be minimal because Eglin will not establish airstrips or HLZs within 500 feet of active RCW trees. Separate analysis would be necessary for any proposed tree clearing within potential RCW habitat, with a possible requirement for additional consultation with the USFWS.

Ground Movements

Troop movements and vehicle traffic may create noise and disturbance that could affect the RCW. To minimize potential for such impacts, Eglin will follow the *Management Guidelines for the Red-Cockaded Woodpecker on Army Installations* (U.S. Army, 2007), which details allowed and restricted activities within 200 ft of active RCW trees. Prior to use of an area for ground movements, an RCW survey would be conducted in the movement corridor, and trees would be marked and added to field maps. Military training within the 200 ft buffer will be limited to military activities of a transient nature (less than two hours of occupation). Some of the activities which are restricted within the 200 foot buffer include generator use, pine tree cutting, and bivouac; a complete list is available in Table 2-4. Additionally, military vehicles are prohibited from occupying a position or traversing within 50 feet of a marked cavity tree, unless on an existing road (U.S. Army, 2007). Minimal impacts to RCWs are anticipated from these transient activities.

Expendables/Equipment Use

Expendables and equipment use would generate noise and smoke that could temporarily disturb or displace RCWs, and there would be a potential for some of these items to start wildfires. Potential noise impacts are minimized by the requirement that training within 200 feet of active RCW trees be of a transient nature (no longer than 2 hours). Additionally, in accordance with the Army guidelines (U.S. Army, 2007), Eglin will only permit the following munitions and pyrotechnics within the 200 foot buffer: small arms blanks, artillery/hand grenade simulators, and smoke grenades (Table 2-4). Generators are restricted within 200 feet of RCW trees. RCWs on BRSF and THSF have demonstrated a degree of adaptability to noise from hunting and other recreational activities and likely have become habituated to these types of noise, at least to some extent, and continue to nest successfully within the forests. Suitable habitat appears to outweigh any negative influences associated with noise.

Expendables can also produce chemical residue that could potentially impact birds through direct contact, ingestion, inhalation, or bio-concentration. The most likely opportunity for such exposure would be immediately after the smoke has been dispelled. However, birds would most likely leave the area during training exercises, thereby reducing the likelihood of direct exposure. The potential for ingestion or inhalation of particles in sufficient amounts to cause harm is also low, due to wind-driven distribution of smoke particles. Additionally, cleanup procedures require that munitions cartridges and expendables debris be picked up after a training mission has been completed.

Expendables use can result in an increased risk of wildfires. Wildfires can be beneficial in some cases, but they can also have negative effects on habitats and species, particularly under dry or

windy conditions. In general, fire is beneficial to the ecosystems found within the action area; fire maintains the native groundcover that supports RCW prey items, and hinders predator access to cavities by decreasing mid-story encroachment. However, wildfires have the potential to damage or kill active RCW cavity trees and trees in foraging habitat if the trees ignite, and may affect individual birds if they are present in the cavity at the time the tree is burning.

Multiple actions will reduce the potential for wildfire impacts, including restriction of campfires and pyrotechnics use during high fire danger periods, frequent prescribed fire in quality RCW foraging habitat, preparation of active RCW cavity trees prior to prescribed burns by removing fuels from the immediate vicinity of the tree, and checks of burn progress in the vicinity of RCW trees by biologist rangers to reduce the potential for fire damage. Additionally, the Air Force will work with the FFS to develop a process similar to the *Wildfire Specific Action Guide* used at Eglin (Table 4-2); these guidelines limit the use of pyrotechnics and campfires on days with higher risk of wildfire, and institutes fire checks (visual observation) after the use of pyrotechnics or munitions. Units will be required to check the fire danger rating daily and to follow the applicable restrictions.

Table 4-2. Wildfire Specific Action Guide Restrictions on Eglin AFB

Fire Danger Rating	Restrictions
Low	No restrictions on missions.
Moderate	No restrictions on pyrotechnics. A fire watch must be posted for at least 20 minutes after completing the use of pyrotechnics.
High	Use caution with pyrotechnics. Post a fire watch for a minimum of 30 minutes after completing use of pyrotechnics. Extra precautions required for campfires.
Very High	Restrict pyrotechnics to hand-thrown simulators or smoke grenades. NO FLARES below 1000 AGL* . Use simulators or grenades only on roads or in pits. Cleared areas for pyrotechnics should be a minimum of 1.5 times the blast radius. No campfires.
Extreme	NO PYROTECHNICS allowed without prior approval from the Wildland Fire Program Manager or their designee at Eglin Natural Resources. No campfires.

*No flares will be used during training operations at BRSF or THSF; AGL = above ground level.

Aircraft Operations

Noise produced by aircraft overflights and helicopter hovering could cause short-term startle effects of individuals inhabiting areas surrounding the LZs/DZs. However, there will be a 500 ft buffer around RCW trees where aircraft operations and LZ/DZ establishment will be restricted. Also, birds would likely habituate to aircraft presence over time, given the ongoing tempo of day-to-day training. Some degree of habituation may already exist for some individuals because a variety of aircraft overflights by civilians, the FFS, and the military currently occurs in the forest regions. Most affected individuals would likely resume normal activities soon after training events are completed. Long-term reactions or significant behavior modifications are not expected from visual aircraft sightings.

Electromagnetic Radiation

Emitter site use would not be expected to result in impacts to RCWs, because RCW habitat would be avoided. The small footprint of the emitter equipment and the use of improved and semi-improved areas would not damage native vegetation. Exposure to potentially harmful levels of EMR is highly unlikely, given that RCWs are not likely to approach areas where humans are active.

Summary of Impacts

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the RCW.

4.1.2 Wood Stork

Although the wood stork is considered to only have potential occurrence at the THSF, if any wood storks are found on the forest, they could be disturbed by GLI activities. Training operations would involve an increase in human activities, possibly causing flight of foraging/roosting wood storks; however, if any wood stork nesting, feeding, or roosting areas were documented on THSF in the future, GLI activities would follow the *Habitat Management Guidelines for the Wood Stork in the Southeast Region* (USFWS, 1990), which limit human activities when feeding, roosting, or nesting wood storks are present. Additionally, ground disturbing activities and pyrotechnics use are restricted in wetland areas which are the primary habitat for wood storks. There would be potential adverse impacts to shoreline and aquatic vegetation due to trampling/rutting associated with landing of watercraft along shorelines, but these impacts would be short term and recoverable through practices such as rotation of boat landing sites.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the wood stork.

4.1.3 Reticulated Flatwoods Salamander and Critical Habitat

Potential impacts to the reticulated flatwoods salamander and its critical habitat at BRSF are minimized by the restriction on activities in the vicinity of the pond, which is located along the southern boundary of the forest. Within the 1500 buffer around the salamander pond, there will be no land disturbing activities for emitter sites or airstrip/LZ/DZ establishment, and all ground operations must remain on established roads including troop movements, vehicle operations, digging and any type of ground surface disturbance. If any additional ponds are identified during future surveys, the same 1500 foot buffer and associated restrictions would apply.

The primary activity of concern for the flatwoods salamander is the use of expendables. Expendables use is not anticipated to affect flatwoods salamanders from chemical residue because their use is restricted within the 1500 foot buffer; however, wildfires started by expendables may impact the flatwoods salamander. In general, fire is beneficial to salamander habitat by maintaining the grassy understory and preventing mid-story encroachment, but fires can cause damage if they burn too hot, smolder, or if fire suppression activities are necessary. Wildfires and wildfire suppression activities in salamander habitat may negatively affect the

flatwoods salamander through modification of hydrology, vegetative damage, sedimentation, and direct mortality. Salamanders may be killed by heavy equipment used during suppression or by the wildfire itself; however, this is unlikely given that salamanders spend the majority of their time underground when not in the breeding pond itself. Additionally, the following special precautions will be followed when prescribed burning or fighting wildfires in sensitive areas on state forest lands. The Incident Commander or Burn Boss will make personnel on fires aware of environmentally sensitive areas, such as flatwoods salamander habitat. During wildfire suppression, emphasis is placed on the use of water and foam, permanent fire breaks, natural barriers and existing roads and trails for firelines. Plowed and/or bulldozed lines will be used only when they prevent the most damage to life, property, or resources and minimize threats to fire fighters. When an area is to be plowed out, lines will be kept to a minimum by following these practices:

- Use the minimum number of plow lines necessary to contain the fire.
- Fire plow line depth should be no greater than minimum required to contain the fire.
- Fire plow lines should not be located in sensitive areas unless required by the emergency nature of the incident. Offset plow lines well to the side of the sensitive area if possible.
- Fire plow lines should be oriented along contours of slope whenever possible.
- Fire plow lines will not bisect or tie into waterways or riparian zones, or be placed downhill at right angles to steep slopes unless required by the emergency nature of the incident. All plow lines will be stabilized and/or rehabilitated following the emergency suppression action.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the reticulated flatwoods salamander, and are **not likely to adversely modify** reticulated flatwoods salamander critical habitat.

4.1.4 Frosted Flatwoods Salamander and Critical Habitat

Potential impacts to the frosted flatwoods salamander and its critical habitat at THSF are minimized by the restriction on activities within 1500 feet of the salamander pond, which is located just outside the northern boundary of the forest. If any additional ponds are identified during future surveys, the same 1500 foot buffer and associated restrictions would apply. Possible impacts from expendables would be similar to those described for the reticulated flatwoods salamander.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the frosted flatwoods salamander and are **not likely to adversely modify** frosted flatwoods salamander critical habitat.

4.1.5 Eastern Indigo Snake

Land disturbance, ground movements, and expendables use have the potential to affect indigo snakes through crushing, wildfires, and chemical impacts. Incidental contact with equipment, vehicles, and troops on foot could result in trampling or crushing of indigo snakes. However, encounters with indigo snakes would be extremely rare given the scarcity of this species on

BRSF and THSF, combined with the snake's ability to escape from potentially injurious situations. Eglin will require that all personnel be informed that if an indigo snake is sighted, they must allow the snake to leave the area undisturbed and immediately report the sighting to Eglin Natural Resources. If an activity has the potential to create significant soil disturbance, a gopher tortoise survey will be completed prior to the activity. If a gopher tortoise burrow is found during the survey and cannot be avoided, then any commensal species such as the indigo snake found in a burrow would be relocated in accordance with the *Eglin AFB Indigo Snake Programmatic Biological Opinion* (USFWS, 2009c).

Wildfires caused by expendables and chemical residue from expendables may affect the indigo snake. Chemicals can interfere with biological processes and physiological functions of reptiles. To minimize exposure, cleanup of munitions cartridges and debris by training groups is required after training is completed. Heavy equipment used during fire suppression could also impact the indigo snake; however, this occurrence is unlikely, as the snake would most likely move away from the area if it sensed a general disturbance in its vicinity, and operators would be instructed to avoid the snake.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the eastern indigo snake.

4.1.6 Gulf Sturgeon and Critical Habitat

Gulf sturgeon and its critical habitat could be affected by sedimentation, chemical impacts, and direct impacts from land disturbance, ground movements, expendables, and amphibious operations. However, the limitation on ground disturbing activities and pyrotechnics use within 100 feet of Gulf sturgeon critical habitat greatly reduces this potential. Amphibious operations adjacent to BRSF TA-9 and THSF TA-10 would move through Gulf sturgeon critical habitat, but the activities would not alter or disturb this species or its habitat. To minimize the potential for erosion, amphibious operations along the Yellow River (BRSF TA-9) and coastal areas at THSF (TA-10) would only use designated boat landing sites, preferably hardened landing areas.

There are no low water crossings in the portion of BRSF that drains to the Yellow River, or in the portion of THSF that drains to the Gulf of Mexico. The portion of the Blackwater River that contains critical habitat for the Gulf sturgeon is over two miles downstream from BRSF. There is a small possibility that sediment disturbed during stream crossings could reach critical habitat on the Blackwater River; however, events involving stream crossings will be infrequent (up to 12 annually with up to 10 vehicles per event) and vehicle access will be prohibited at stream and wetland crossings rated in poor condition. No impacts to Gulf sturgeon critical habitat at THSF or BRSF are anticipated from low water crossing activities.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the Gulf sturgeon and are **not likely to adversely modify** Gulf sturgeon critical habitat.

4.1.7 Piping Plover and Critical Habitat

Training activities would avoid piping plover critical habitat thereby reducing the potential for impacts to plovers. However, helicopter and low-level aircraft activities, and amphibious and land-based activities outside of critical habitat may result in a startle effect to plovers near the area and could temporarily interfere with foraging activities. In these situations, noise associated with the training activities could temporarily flush the birds from the area, possibly causing stress and extra caloric expenditure; however, birds would be expected to simply move on to undisturbed foraging areas during the course of the activity. Because disturbance would be temporary and localized in nature, these activities may cause minimal harassment to piping plovers and no direct impacts are expected. Piping plover designated critical habitat and other known piping plover feeding areas (including those outside of designated critical habitat) will be marked on field maps for avoidance.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the piping plover and would have **no effect** on piping plover critical habitat.

4.1.8 Purple Bankclimber and Critical Habitat

The purple bankclimber and its critical habitat could be affected by sedimentation and chemical impacts. However, the limitation on ground disturbing activities and pyrotechnics use within 100 feet of purple bankclimber critical habitat greatly reduces this potential. Amphibious operations would move through purple bankclimber critical habitat, but the activities would not alter or disturb this species or its habitat. To minimize the potential for erosion, amphibious operations along the portion of the Ochlocknee River where there is critical habitat (northern portion of TA-3 at THSF) would only use designated boat landing sites, preferably hardened landing areas.

There is only one low water crossing in the portion of THSF that drains to the Ochlocknee River, and it is over one mile from bankclimber critical habitat, thus no impacts to the bankclimber are anticipated from low water crossing activities.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the purple bankclimber and are **not likely to adversely modify** purple bankclimber critical habitat.

4.1.9 Choctaw Bean, Narrow Pigtoe, Southern Sandshell, Fuzzy Pigtoe and Critical Habitat

The Choctaw bean, narrow pigtoe, southern sandshell, and fuzzy pigtoe and their critical habitat could be affected by sedimentation and chemical impacts. However, the limitation on ground disturbing activities and pyrotechnics use within 100 feet of their critical habitat greatly reduces this potential. Amphibious operations would move through mussel critical habitat, but the activities would not alter or disturb these species or their habitat. To minimize the potential for erosion, amphibious operations along the Yellow River (BRSE TA-9) would only use designated boat landing sites, preferably hardened landing areas.

There are no low water crossings in the portion of BRSF that drains to the Yellow River, thus no impacts to the freshwater mussels in the Yellow River are anticipated from low water crossing activities.

With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the Choctaw bean, narrow pigtoe, southern sandshell, or fuzzy pigtoe, and are **not likely to adversely modify** freshwater mussel critical habitat.

4.1.10 Godfrey's Butterwort

Activities with the potential to impact the Godfrey's butterwort include land disturbance, ground movement, and expendables use. However, prior to any land disturbance, areas must be surveyed for sensitive species, thus any butterworts in the area would be identified. All known locations of Godfrey's butterwort will be shown as "restricted" on field maps, which means that all activities must remain on roadbeds of established roads, including troop movements, vehicle operations, digging, and any type of ground surface disturbance. Additionally, all known locations of the butterwort at THSF are within wetland areas and Florida Natural Areas Inventory (FNAI)-designated Special Natural Areas, where ground disturbing activities are also limited.

Wildfires caused by expendables use have the potential to affect the Godfrey's butterwort. In general, fire is beneficial by limiting the growth of shrubs and saplings in the understory, but fires can cause damage if they burn too hot, smolder, or if fire suppression activities are necessary. Wildfires and wildfire suppression activities may negatively affect the butterwort through modification of hydrology and direct mortality. Plants may be unintentionally killed by heavy equipment used during suppression or by the wildfire itself. However, fire crews are directed to avoid plowing off established roads within sensitive wetland areas except in extreme conditions.

No GRASI LI activities would involve the intentional damaging or destruction of the Godfrey's butterwort, and GRASI LI activities would not jeopardize the continued existence of the butterwort. With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the Godfrey's butterwort.

4.1.11 Florida Skullcap

Land disturbance, ground movement, and expendables use have the potential to impact the Florida skullcap. However, prior to any land disturbance, areas must be surveyed for sensitive species, thus any skullcaps in the area would be identified. All known locations of the Florida skullcap will be shown as "restricted" on field maps, which means that all activities must remain on roadbeds of established roads, including troop movements, vehicle operations, digging, and any type of ground surface disturbance. Additionally, the Florida skullcap is found in wetland habitats, where activities are limited to established roads, including vehicle operations, digging, and any type of ground surface disturbance. Potential impacts from wildfires would be similar to those described earlier for the Godfrey's butterwort.

No GRASI LI activities would involve the intentional damaging or destruction of the Florida skullcap, and GRASI LI activities would not jeopardize the continued existence of the skullcap. With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the Florida skullcap.

4.1.12 White Birds-in-a-nest

White-birds-in-a-nest may be affected by land disturbance, ground movement, and expendables use. However, prior to any land disturbance, areas must be surveyed for sensitive species, thus any white birds-in-a-nest in the area would be identified. All known locations of the white birds-in-a-nest will be shown as “restricted” on field maps, which means that all activities must remain on roadbeds of established roads, including troop movements, vehicle operations, digging, and any type of ground surface disturbance. Additionally, the white birds-in-a-nest is typically found in wetland habitats, where activities are limited to established roads, including vehicle operations, digging, and any type of ground surface disturbance. Potential impacts from wildfires would be similar to those described earlier for the Godfrey’s butterwort.

No GRASI LI activities would involve the intentional damaging or destruction of the white birds-in-a-nest, and GRASI LI activities would not jeopardize the continued existence of the white birds-in-a-nest. With the implementation of conservation measures in Section 2.3, GRASI LI activities may affect, but are **not likely to adversely affect** the white birds-in-a-nest.

4.1.13 Telephus Spurge

There are currently no documented occurrences of the telephus spurge on THSF. If this species is found on the forest in the future, then that area would be shown as “restricted” on field maps, which means that all activities must remain on roadbeds of established roads, including troop movements, vehicle operations, digging, and any type of ground surface disturbance. Additionally, prior to any land disturbance, areas must be surveyed for sensitive species, thus any spurges in the area would be identified. Potential impacts from wildfires would be similar to those described earlier for the Godfrey’s butterwort.

No GRASI LI activities would involve the intentional damaging or destruction of the telephus spurge, and GRASI LI activities would not jeopardize the continued existence of the spurge. GRASI LI activities may affect, but are **not likely to adversely affect** the telephus spurge.

4.1.14 Conservation Measures

The Conservation Measures in Section 2.3 of this GLI Section 7 Consultation are commitments made by Eglin AFB as part of the Proposed Action. Proponents are responsible for ensuring these Conservation Measures are implemented. If Eglin AFB (1) fails to assume and assure implementation of the Conservation Measures or (2) fails to require the participants in the GLI activities to adhere to the Conservation Measures through enforceable terms, the protective coverage of section 7(o)(2) of the ESA may lapse, and may result in penalties, fines, and immediate operational shut-down of the GLI training activity.

4.1.15 Summary of Potential Impacts

The following tables summarize the potential for direct physical impacts, harassment impacts, and habitat impacts to federally listed species at BRSF and THSF (Table 4-3 and Table 4-4).

Table 4-3. Potential Impacts to Federally Listed Species at BRSF

Proposed Activity	Red-cockaded Woodpecker	Reticulated Flatwoods Salamander and Critical Habitat	Eastern Indigo Snake	Gulf Sturgeon and Critical Habitat	Yellow River Mussel Species and Critical Habitat
Land Disturbance	H	NI	DPI, H, Hb	Hb	
Ground Movement	H, Hb	DPI, Hb			
Expendables/Equipment					
Aircraft Operations	H	NI		NI	Hb
Amphibious Operations	NI			DPI, H, Hb	
Electromagnetic Radiation				NI	

DPI = Direct Physical Impact, H = Harassment, Hb = Habitat Impacts, NI = No Impact

Table 4-4. Potential Impacts to Federally Listed Species at THSF

Proposed Activity	Red-cockaded Woodpecker	Wood Stork	Frosted Flatwoods Salamander and Critical Habitat	Eastern Indigo Snake	Gulf Sturgeon and Critical Habitat	Piping Plover and Critical Habitat	Godfrey's Butterwort	Florida Skullcap	White Birds-in-a-nest	Telephus Spurge	Purple Banklumber and Critical Habitat
Land Disturbance	H		NI	DPI, H, Hb	Hb	NI					Hb
Ground Movement	H, Hb					DPI, Hb	DPI, H	DPI, Hb			
Expendables/Equipment											
Aircraft Operations	H		NI	NI	NI	H	NI				
Amphibious Operations	NI	H, Hb			DPI, H, Hb						
Electromagnetic Radiation		NI									NI

4.2 OTHER SPECIES CONSIDERED

4.2.1 Gopher Tortoise

While it is possible that gopher tortoises or their burrows could be directly impacted during ground training exercises, this risk would be minimal due to the fact that vehicle movements would be limited to established roads, and any burrows identified at the camps sites, HLZ/LZ areas, or other high use areas would be marked for avoidance by 25 feet. If a tortoise burrow could not be avoided by 25 ft, then Eglin would be required to obtain a gopher tortoise relocation permit from the FWC and conduct the relocation of the tortoise in accordance with FWC protocols (described at <http://myfwc.com/media/1410274/GTPermittingGuidelines.pdf>). Similarly, areas slated for ground disturbing activities would be surveyed for gopher tortoises, and burrows would be avoided where possible; burrows that cannot be avoided would be relocated. Units will be informed that if a gopher tortoise is sighted, personnel must allow the tortoise to leave the area undisturbed.

Expendables may affect the gopher tortoise from chemical residue or wildfire suppression impacts. Chemical residue from expendables has the potential to impact gopher tortoise health if ingested or accumulated in soils and water. Chemicals can interfere with biological processes and physiological functions of reptiles. To minimize exposure, cleanup of munitions cartridges and debris by training groups is required after training is completed. The gopher tortoise may also be affected by heavy equipment used during wildfire suppression. However, this occurrence is unlikely, as the tortoise would most likely move away from the area if it sensed a general disturbance in its vicinity. Equipment operators would be directed to avoid any tortoises or burrows they spot.

With the implementation of conservation measures in Section 2.3, impacts from GRASI LI activities would not be significant to the gopher tortoise.

4.2.2 Federally Petitioned Animal Species

Land disturbance, ground movement, expendables use, and amphibious operations may impact the following federally petitioned animal species: Westfall's clubtail, one-toed amphiuma, Barbour's map turtle, Escambia map turtle, and Florida red-bellied turtle. However, the limitation on ground disturbing activities and pyrotechnics use within 100 feet of streams and wetlands greatly reduces this potential. Adult clubtails may forage in open forest where ground operations occur; however, the likelihood of encounters is very low because most ground operations would be on established roads and cross-country dismounted movements are infrequent and dispersed (up to eight times annually with up to 72 personnel per event). The remainder of these species, along with the larval form of the clubtail, are found in aquatic, wetland, and riparian habitats, where activities are limited to established roads, including vehicle operations, digging, and any type of ground surface disturbance. Amphibious operations may prompt basking turtles to drop into the water, but turtles would be expected to return once boats had passed. The small number of operations involving the use of low water crossings (up to 12 annually with up to 10 vehicles per event) has a low probability of impacts to federally petitioned species; however, the Air Force will implement the following conservation measures to reduce potential impacts: 1) low-water crossings on known Westfall's clubtail streams would not be

used, and 2) troops would check for turtles prior to use of low-water crossings and allow the turtles to clear the crossing before use. Additionally, all known locations of these petitioned species will be shown as “restricted” on field maps, which means that all activities must remain on roadbeds of established roads, including troop movements, vehicle operations, digging, and any type of ground surface disturbance.

With the implementation of conservation measures in Section 2.3, impacts from GRASI LI activities would not be significant to the Westfall’s clubtail, one-toed amphiuma, Barbour’s map turtle, Escambia map turtle, or Florida red-bellied turtle.

4.2.3 Federally Petitioned Plant Species

Land disturbance, ground movement, and expendables use have the potential to impact the following federally petitioned plant species: West’s flax, Curtiss’ loosestrife, bear tupelo, small-flower meadow-beauty, Henry’s spider-lily, Panhandle lily, and Gulf sweet pitcher plant. However, all known locations of these species will be shown as “restricted” on field maps, which means that all activities must remain on roadbeds of established roads, including troop movements, vehicle operations, digging, and any type of ground surface disturbance. Additionally, these species are found in wetland habitats, where GLI activities are limited to established roads.

Wildfires caused by expendables use have the potential to affect these plant species. In general, fire is beneficial these species, but fires can cause damage if they burn too hot, smolder, or if fire suppression activities are necessary. Wildfires and wildfire suppression activities may negatively affect these plants through modification of hydrology and direct mortality. Plants may be unintentionally killed by heavy equipment used during suppression or by the wildfire itself. However, fire crews are directed to avoid plowing off established roads within sensitive wetland areas except in extreme conditions.

With the implementation of conservation measures in Section 2.3, impacts from GRASI LI activities would not be significant to the West’s flax, Curtiss’ loosestrife, bear tupelo, small-flower meadow-beauty, Henry’s spider-lily, Panhandle lily, or Gulf sweet pitcher plant.

4.2.4 Bald Eagle

The primary issue of concern for the bald eagle is the potential for impacts from human presence and noise. To avoid these impacts, buffer zones will be delineated for nest trees. Aircraft operations will not occur within 1,000 feet of an eagle nest during the nesting season (October 1 to May 15), and training activities will follow the *National Bald Eagle Management Guidelines* within 330 feet of an eagle nest during the nesting season. Potential exposure to chemical residue is minimized by required cleanup of munitions cartridges and debris by training groups once training is complete.

With the implementation of conservation measures in Section 2.3, impacts from GRASI LI activities would not be significant to the bald eagle.

4.2.5 State-listed Animal Species

In accordance with the *Florida Endangered Species Protection Act*, no GRASI LI activities would involve the intentional wounding or killing of any state-listed fish or wildlife species. The list of animal species approved for consumption will not include any state-listed species; pictures will be provided to troops so that only approved species are taken.

With the implementation of conservation measures in Section 2.3, impacts from GRASI LI activities would not be significant to State-listed animal species.

4.2.6 State-listed Plant Species

In accordance with the *Florida Endangered Species Protection Act* and the *Preservation of Native Flora of Florida Act*, no state-listed plants would be purposefully harvested or destroyed. The list of plant species approved for consumption, camouflage, and other mission uses will not include any state-listed species; pictures will be provided to troops so that only approved species are taken.

With the implementation of conservation measures in Section 2.3, impacts from GRASI LI activities would not be significant to State-listed plant species.

5. CONCLUSION

Based on analysis of potential direct physical impacts, harassment, and habitat impacts associated with the proposed land disturbance, ground movement, expendables/equipment use, amphibious operations, and air operations, the RCW, wood stork, reticulated flatwoods salamander and critical habitat, frosted flatwoods salamander and critical habitat, eastern indigo snake, Gulf sturgeon and critical habitat, piping plover and critical habitat, purple bankclimber and critical habitat, Choctaw bean and critical habitat, narrow pigtoe and critical habitat, southern sandshell and critical habitat, fuzzy pigtoe and critical habitat, Godfrey's butterwort, Florida skullcap, white birds-in-a-nest, and telephus spurge may be affected, but are not likely to be adversely affected by the Proposed Action. Eglin will implement the Conservation Measures listed in Section 2.3 to minimize potential negative effects of GLI activities.

The NRS will notify the USFWS immediately if any of the actions considered in this Biological Assessment are modified or if additional information on listed species becomes available, as a re-initiation of consultation may be required. If impacts to listed species occur beyond what has been considered in this assessment, all operations will cease, and the USFWS will be notified. Any modifications or conditions resulting from consultation with the USFWS will be implemented prior to commencement of activities.

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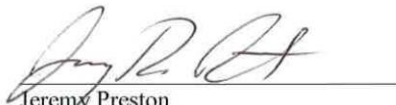
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INFORMAL CONSULTATION REGARDING**IMPACTS TO FEDERALLY LISTED SPECIES
RESULTING FROM GULF REGIONAL AIRSPACE STRATEGIC INITIATIVE (GRASI)
LANDSCAPE INITIATIVE TRAINING AREAS**

Reviewed by:

Jeremy Preston
Endangered Species Biologist
Eglin Natural Resources1-22-14
DateLarry Chavers
Chief, Eglin Natural Resources1-22-14
Date**USFWS CONCURRENCE:**Project Leader
U.S. Fish and Wildlife Service
Panama City, FL4/9/14
Date04 EF 3000-2014-I-0107
FWS Log No.

C.4 PROGRAMMATIC AGREEMENT

The Air Force has completed consultation with the Florida State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), and Native American tribes in accordance with Section 106 of the National Historic Preservation Act (NHPA); a Programmatic Agreement outlines requirements associated with cultural resources protection and mitigation. A copy of the signed Programmatic Agreement is included in this appendix.

**FLORIDA DEPARTMENT of STATE**

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

Ms. Maria D. Rodriguez
Chief, Environmental Management Branch
96 CEG/CEIE
501 DeLeon Street, Suite 101
Eglin AFB, Florida 32542-5105

March 2, 2015

RE: DHR Project File No.: 2015-0644
Re: Programmatic Agreement (PA) Proposal for the Gulf Regional Airspace Strategic Initiative (GRASI)

Dear Ms. Rodriguez:

Find enclosed four copies of the GRASI Programmatic Agreement. Each one has been signed by the Florida State Historic Preservation Officer. Once the other signature have been obtained, please return one of the original documents to our office.

If you have any questions, please contact me by email at Timothy.Parsons@dos.myflorida.com, or by telephone at 850.245.6333 or 800.847.7278.

Sincerely,

Timothy A. Parsons, Ph.D, RPA
Deputy State Historic Preservation Officer
for Compliance and Review



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**PROGRAMMATIC AGREEMENT
AMONG
EGLIN AIR FORCE BASE
THE FLORIDA STATE HISTORIC PRESERVATION OFFICER
REGARDING
THE PROPOSED GULF REGIONAL AIRSPACE STRATEGIC INITIATIVE
LANDSCAPE INITIATIVE**

WHEREAS, Eglin Air Force Base (Eglin AFB), in cooperation with the State of Florida, proposes to expand air and ground training opportunities in the Florida Gulf Region by leasing various parcels and obtaining special use permits to conduct training operations within two existing State Forests: The Blackwater River State Forest (BWSF) and Tate's Hell State Forest (THSF); and

WHEREAS, the Gulf Regional Airspace Strategic Initiative Landscape Initiative (GLI), as further described below, will enable Eglin AFB, and other Department of Defense installations in the Florida Gulf Region, to access the state forest lands for training when the Eglin AFB reservation is not available; and

WHEREAS, GLI is a federal undertaking subject to Section 106 of the National Historic Preservation Act (16 U.S.C. 470 et seq.) and its implementing regulations at 36 CFR Part 800; and

WHEREAS, multiple cultural resources inventories conducted at BWSF and THSF in the past have identified historic and prehistoric archaeological sites, two historic cemeteries, and the remains of a World War II era training camp, all of which may be eligible for listing in the National Register of Historic Places (NRHP); and

WHEREAS, Eglin AFB, in consultation with the Florida State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Places (ACHP), has determined that the air and ground training activities associated with GLI have the potential to adversely affect historic properties; and

WHEREAS, to meet its Section 106 responsibilities and in anticipation of the need to resolve any adverse effects to historic properties that may result from GLI, Eglin AFB has prepared this Programmatic Agreement (PA) in accordance with 36 CFR §800.14 (b); and

WHEREAS, pursuant to 36 CFR §800.6 (a)(1), Eglin AFB has notified the ACHP of a finding of adverse effect for the GLI undertaking and has invited the ACHP to participate in consultations on the undertaking and the ACHP has declined the invitation; and

WHEREAS, Eglin AFB has consulted with the Florida Forest Service (FFS), manager of BWSF and THSF, and the FFS has elected to participate in drafting the PA as a concurring party; and

WHEREAS, Eglin AFB has consulted with five federally recognized tribes, the Miccosukee Tribe of Indians of Florida, the Seminole Tribe of Florida, the Poarch Band of Creek Indians of

Alabama, the Muskogee (Creek) Nation of Oklahoma, and the Thlopthlocco Tribal Town of the Creek (Muscogee) Nation of Oklahoma (hereafter the Tribes), concerning historic properties of religious and cultural significance that may be affected by the undertaking and has invited the Tribes to participate as concurring parties to this agreement. Only the Miccosukee Tribe of Indians of Florida and the Seminole Tribe of Florida responded by declining to sign the PA as a concurring party.

NOW THEREFORE, the signatories to this PA agree that the GLI undertaking will be implemented in accordance with the following stipulations.

Background

I. Description of the Undertaking

- A. The GLI undertaking will involve ground and air support training in BWSF and TSHF (See maps in Appendix A). The GLI undertaking will also require the temporary use of 12 existing radar emitter locations for air traffic control purposes (See map in Appendix B). The undertaking will involve multiple activities with varying potential for effect to historic properties as described below.
 1. Training activities within BWSF and TSHF with potential to affect historic properties
 - a) Dirt roads/landing strips: Several existing dirt roads will be expanded to accommodate take off and landings by small fixed wing aircraft. Some blading along road shoulders will be needed to prepare the dirt roads.
 - b) Helicopter landing zones: A small number of existing areas cleared of trees through logging by FFS in the past will be used for helicopter landing zones.
 - c) Non-improved cleared areas: CV-22 osprey aircraft will use areas that are harvested for timber and annually cleared by the FFS. Some but not all of these areas will be used for training.
 - d) Hardened camps: There are two existing facilities in the Blackwater River State Forest that will be used for urban combat training: the STOP Camp and the Santa Rosa Youth Academy. Neither facility is a historic property. Both camps are previously disturbed.
 - e) Temporary Combat Support Areas: Medical tents and related temporary facilities will be limited to previously disturbed areas adjacent to helicopter landing zones.
 - f) Bivouac Areas: Temporary shelters will be limited to previously disturbed areas where the ground surface has been visibly altered by previous activities including, but not limited to, logging and/or construction. Emplacements such as wire and pickets associated with the Bivouac areas will also be limited to previously disturbed ground.

2. Training activities with little potential to affect historic properties

Emitter sites: 12 temporary radar installations in locations throughout northwest Florida will be used as part of training. Eleven of the emitter sites are on state land (FFS or Florida Fish and Wildlife Conservation Commission). The remaining site is on Eglin AFB. Each emitter site has been improved or semi-improved resulting in ground disturbance to varying degrees. Minor improvements, such as fencing and vegetative clearing, may be needed.

3. Training activities with no potential to affect historic properties

- a) Existing roadways: All vehicular traffic will be confined to existing roadways and stream crossings. No off-road vehicular travel will be conducted. No effect to historic properties is expected.
- b) Amphibious landing areas: On rare occasions training on the Blackwater River may be conducted involving small inflatables with no effect to shorelines. No effect to historic properties is expected.
- c) Pedestrian troop movements: Small squads of trainees will walk through the forest from one location to another. No effect to historic properties is expected.

Eglin AFB will ensure that the following stipulations are carried out.

Stipulations

II. Area of Potential Effect

- A. The Area of Potential Effect (APE) for the training activities described in Stipulation I.A.1 will initially include all lands within the BWSF and THSF. As the nature and location of each training activity is identified, Eglin AFB will narrow the APE to include the proposed training area plus a 100 meter buffer. Multiple training areas may be incorporated into a single APE or may be defined as separate APEs, as needed. Eglin AFB will map the APE boundaries and provide this information to FFS and military trainers.
- B. The APE for the emitter sites described in Stipulation I.A.2 will be the property boundary of the proposed emitter locations without a buffer.

III. Identification

- A. Once the APE is identified, Eglin AFB will ensure that the APE is surveyed for historic properties. Historic property is defined in 36 CFR §800.16 (1)(1) to mean any historic or prehistoric district, site, building, structure, or object included in or eligible for inclusion in the NRHP. All surveys will be conducted and reported on following the standards and guidelines in Stipulation VII by a qualified professional as specified in Stipulation VIII.

- B. Where possible, Eglin AFB will re-locate and re-record any previously identified cultural resources within the APE. Existing Florida Master Site File (FMSF) forms will be updated or new forms will be prepared, as needed. All new cultural resources will be recorded on FMSF forms.
- C. To enable a determination of NRHP eligibility, Eglin AFB may conduct archaeological testing on any site recorded or re-recorded during survey. Archaeological testing for NRHP eligibility will be limited to the recovery of information needed to determine the nature, extent, age, condition and NRHP eligibility of the archaeological site. Testing will be conducted and reported on in accordance with the standards and guidelines in Stipulation VII and conducted by a qualified professional as specified in Stipulation VIII.
- D. Eglin AFB will conduct a records check of each emitter site to determine if the site location has been surveyed and if previously recorded cultural resources have been identified. Where cultural resources have not been recorded through previous survey, no new survey will be conducted. Where previous survey has identified cultural resources on the emitter site location or within 100 feet of the site location's property boundary, Eglin AFB will conduct a survey of the emitter site in accordance with Stipulation III.A.
- E. Areas to be used for training activities that have no potential to affect historic properties as described in Stipulation I.A.3 will not be surveyed for cultural resources. These areas will be exempt from survey and will not require further consideration under this PA, unless there is an unanticipated archaeological discovery during training (see Stipulation XI).
- F. Eglin AFB will consult with the Tribes and SHPO regarding properties of religious and cultural significance, otherwise known as traditional cultural properties (TCPs). Should any Tribe indicate that TCPs are known within BWSF or THSF or identify areas that may contain TCPs, Eglin AFB, in consultation with the SHPO and the concerned tribe or tribes will conduct an ethnographic study and prepare a survey report. The purpose of the ethnographic study will be to identify and characterize any TCPs and evaluate their NRHP eligibility.
- G. Once identification is complete, Eglin AFB will ensure that a survey report is prepared identifying and evaluating any cultural resources recorded or re-recorded in the APE. Eglin AFB will submit the survey report, any FMSF forms, and, if warranted, an archaeological testing report to SHPO, FFS and the Tribes for consultation on NRHP eligibility under Stipulation IV.

IV. National Register Eligibility

- A. Eglin AFB, in consultation with SHPO and FFS, will determine the NRHP eligibility of all cultural resources recorded within the training APE in accordance with 36 CFR §800.4(c). Eglin AFB will also consult with the Tribes on the NRHP eligibility of any prehistoric archaeological sites or TCPs.

- B. Should SHPO or the Tribes object to a determination of NRHP eligibility, Eglin AFB will attempt to resolve the objection following Stipulation XIII. If the dispute over the NRHP eligibility determination cannot be resolved, Eglin AFB will submit the dispute to the Keeper of the National Register for final determination in accordance with 36 CFR §800.4(c)(2).

V. Assessment of Effect

- A. Eglin AFB, in consultation with SHPO and FFS, will assess the effects of proposed training on historic properties. Where no cultural resources are found within the APE, or cultural resources are found but are determined not to meet the NRHP eligibility criteria, Eglin AFB will determine that “no historic properties are affected” in accordance with 36 CFR §800.4 (d) (1). Eglin AFB will notify FFS and military trainers that the APE is cleared for training use.
- B. If Eglin AFB determines that proposed training may affect historic properties in accordance with 36 CFR §800.4 (d) (2), it will assess the effects by applying the criteria of adverse effects at 36 CFR §800.5 (a) (1). Eglin AFB will also consult with the Tribes if potentially affected historic properties include prehistoric archaeological sites, historical archaeological sites if requested and or TCPs. Eglin AFB, in consultation with SHPO, FFS, and the Tribes, when warranted, will make one of two effect determinations:
 - 1. “No adverse effect,” the proposed training activity will affect historic properties but will not diminish their historic integrity. Eglin AFB may propose conditions to minimize the effects of proposed training to historic properties.
 - 2. “Adverse effect,” the proposed training activity will alter the characteristics that make historic properties NRHP eligible by diminishing their historic integrity. Eglin AFB will follow Stipulation VI to resolve any adverse effects to historic properties.
- C. Should SHPO or the Tribes object to a determination of effect within 30 days after being notified of the determination, Eglin AFB will attempt to resolve the objection following Stipulation XIII. If the dispute over the effect determination cannot be resolved, Eglin AFB will submit the dispute to the ACHP for comment in accordance with 36 CFR §800.5(c)(2).

VI. Resolution of Adverse Effect

- A. Eglin AFB will continue to consult with SHPO and FFS to avoid, minimize or mitigate the adverse effects of proposed training on historic properties. If the historic properties include prehistoric archaeological sites and or TCPs, Eglin AFB will also consult with the Tribes.
- B. Eglin AFB will, wherever possible, avoid effects to historic properties and will work with the FFS and the military trainers to achieve avoidance. Two historic cemeteries have

been identified on BRSF: The Concord/Simmons Cemetery (8SR00891) and the Sellersville Cemetery (8SR01216). Both cemeteries will be avoided by all GRASI related training activities.

- C. Avoidance and preservation in place will require use of highly visible avoidance measures to communicate “off limits” to trainees. The avoidance measures will encircle the avoided property plus a 15 meter buffer around the property’s recorded limits. Avoidance measures may include one or more of the following as needed.
 - 1. Flagging: Installing temporary flagging around the limits of the property using colored flagging tape.
 - 2. Painting trees/vegetation: Applying highly visible paint to trees or other vegetation.
 - 3. Temporary fencing: Installing temporary fencing around the limits of property using removable fencing, such as chain link fencing or wire and T posts.
 - 4. Signage: Installing signage at eye level in proximity to the property.
- D. When avoidance can be achieved following Stipulation VI.B, Eglin AFB will install the avoidance measures in the field prior to training, and if warranted, remove them after training is completed. Following installation, Eglin AFB will notify military trainers that training may proceed in the APE on the condition that no training activities are allowed inside areas marked “off limits.” Under these circumstances, Eglin AFB will determine that “no historic properties are affected” in accordance with 36 CFR §800.4(d) (1). Prior consultation with SHPO and FFS or the Tribes will not be required; however, Eglin AFB will prepare a letter report describing the historic property, its location, the training activity, and the measures installed to ensure avoidance. Multiple avoided historic properties may be included in a single letter report. Copies of the letter report will be submitted concurrently to SHPO and FFS within 30 days following Eglin AFB’s notification to military trainers. If the avoided properties are prehistoric archaeological sites and/or TCPs, Eglin AFB will also send the letter report on avoidance to the Tribes within the same time 30 day time period.
- E. When avoidance is not possible, and proposed training will result in an adverse effect, Eglin AFB will resolve the adverse effect in accordance with 36 CFR §800.6. Eglin AFB will notify the ACHP of an adverse effect finding under 36 CFR §800.6 (a) (1) and inform the ACHP that Eglin AFB will prepare a Memorandum of Agreement (MOA) pursuant to 36 CFR §800.6 (c). Eglin will also consult the Tribes when developing this MOA if the adversely affected historic properties are TCPs or NRHP eligible prehistoric sites, as well as eligible historic sites, if the Tribes so request. One or more historic properties may be included in the MOA, if the signatories agree that such an approach is appropriate.

VII. Standards and Guidelines

Eglin AFB will ensure that all work conducted in accordance with the terms of this PA will meet the standards and guidelines for identification, evaluation, and documentation contained in the “Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation” (1983). In addition, all work will be conducted in a manner consistent with “Florida Module 3 Guidelines for Use by Historic Preservation Professionals” and Rule 1A-46 of the Florida Administrative Code.

VIII. Professional Qualifications

All work performed in compliance with the terms of this PA shall be conducted by, or under the supervision of, a qualified professional meeting the Secretary of the Interior’s Historic Preservation Professional Qualification Standards for historic and prehistoric archaeology, architectural history, historic architecture, cultural anthropology or history, as appropriate ([Federal Register: June 20, 1997 (Volume 62, Number 119)][Pages 33707-33723])

IX. Curation

All artifacts recovered and records produced during cultural resources survey and archaeological testing that is conducted pursuant to this agreement is the property of the state of Florida. Eglin AFB will coordinate with FFS to transfer the artifacts and records to the state for curation following any analysis that may be required.

X. Coordination

- A. Eglin AFB will coordinate with FFS and the military trainers through advanced planning to ensure that the terms of this PA are met prior to and during any proposed training and may establish a coordinating working group for this purpose. The GLI coordinating group will include members of the Eglin AFB cultural resources staff.
- B. Eglin AFB, in coordination with FFS and military trainers, will evaluate the efficacy of the PA through periodic field inspections after training activities have concluded. The field inspections will occur at least once a year. Any amendments to the PA that are needed to improve its performance will be addressed in accordance with Stipulation XIV.

XI. Unanticipated Archaeological Discoveries

- A. If a previously unknown archaeological site is discovered during training, or an unanticipated effect to a known archaeological site is discovered during training, Eglin AFB shall immediately take the following steps.
 - 1. All ground disturbances in the vicinity of the discovery shall cease and the discovery location will be secured from further disturbance.

2. A professional, meeting the qualification standards of Stipulation VIII shall record the discovery evaluating its nature, extent, age, condition, and NRHP eligibility and prepare a field report.
 3. The field report will be prepared within 48 hours and be submitted to the Eglin AFB Cultural Resources Manager.
- B. Eglin AFB shall notify FFS and consult with SHPO on the NRHP eligibility of the discovery and the potential effect of continued training on the site within three days of the discovery. If the discovery is a prehistoric archaeological site, Eglin AFB will also consult with the Tribes concurrently with the SHPO.
 - C. If, in consultation with SHPO and when applicable the Tribes, Eglin AFB determines that the discovery is NRHP eligible and testing and or data recovery is warranted, Eglin AFB shall conduct the investigation following the standards and guidelines in Stipulation VII.

XII. Human Remains

- A. If human remains and associated funerary objects are discovered in an unmarked grave either during approved archaeological excavation or during subsequent training, Eglin AFB shall immediately secure the discovery location and follow the procedures in Florida Statutes, Title XLVI, Chapter 872.05 – unmarked human burials.
- B. Where permissible under state law, and in accordance with the wishes of the Tribes, Eglin AFB will rebury the human remains and associated funerary objects as close as possible to the original discovery location in a place that will not be disturbed in the future. Eglin AFB will map the location of the reburial but will not mark the reburial location in any manner.

XIII. Dispute Resolution

- A. Should any signatory to this PA object to any action carried out, or proposed by, Eglin AFB with respect to the implementation of this PA, Eglin AFB shall consult with that signatory party to resolve the objection. If after initiating such consultation Eglin AFB determines that the objection cannot be resolved Eglin AFB shall forward documentation relevant to the objection to the ACHP, including a proposed response to the objection. Within thirty (30) days after receipt of all pertinent documentation, the ACHP shall exercise one of the following options:
 1. Advise Eglin AFB that the ACHP concurs in its proposed final decision, whereupon Eglin AFB shall respond accordingly;
 2. Provide Eglin AFB with recommendations, which it shall take into account in reaching a final decision regarding its response to the objection; or

3. Notify Eglin AFB that the objection will be referred to the ACHP membership for formal comment and proceed to refer the objection and comment within forty-five (45) days. The resulting comment shall be taken into account by Eglin AFB in accordance with 36 CFR § 800.7(c)(4).
- B. Should the ACHP not exercise one of the above options within forty-five (45) days after receipt of all pertinent documentation, Eglin AFB may make a final decision on the dispute and proceed accordingly.
- C. Eglin AFB shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; its responsibility to carry out all actions under this PA that are not the subjects of the objection shall remain unchanged.

XIV. Amendments

Any signatory to this agreement may request that the agreement be amended, whereupon the other parties will consult to consider such amendment. Where there is no consensus among the signatories, the agreement will remain unchanged.

XV. Termination

Any signatory to this agreement may revoke it upon written notification to the other parties by providing thirty (30) days' notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, Eglin AFB will comply with 36 CFR Parts 800.3 through 800.6 with regard to individual aspects of the undertaking covered by this agreement.

XVI. Periodic Review

Every year, or as often as the parties agree, Eglin AFB shall meet with the SHPO and FFS to review the performance of this agreement and determine if amendments are needed to improve its effectiveness.

XVII. Sunset Provision

This PA shall become effective on the date it is signed by the ACHP and shall remain in effect for a period of ten (10) years, unless extended by unanimous approval of the signatories or terminated in accordance with Stipulation XV.

XVIII. Execution

Execution of this Agreement and implementation of its terms is evidence that Eglin AFB has taken into account the effects of the proposed GLI undertaking on historic properties in fulfillment of Section 106 of the National Historic Preservation Act, and has afforded the ACHP an opportunity to comment.

Signatories

EGLIN AIR FORCE BASE

By:  Date: 2 Feb 15
 DAVID A. HARRIS
 Brigadier General, USAF
 Commander, 96th Test Wing

FLORIDA STATE HISTORIC PRESERVATION OFFICER

By:  Date: 2/27/15
 Mr. Robert Bendus, State Historic Preservation Officer

Concurring Parties:

FLORIDA FOREST SERVICE

By: _____ Date: _____
 Mr. John Browne, Land Programs Administrator

POARCH BAND OF CREEK INDIANS OF ALABAMA

By: _____ Date: _____
 Mr. Buford L. Rolin, Tribal Chairman

MICCOSUKEE TRIBE OF INDIANS OF FLORIDA

By: _____ Date: _____
Mr. Colley Billie, Chairman

MUSKOGEE (CREEK) NATION OF OKLAHOMA

By: _____ Date: _____
Mr. George Tiger, Principal Chief

THE SEMINOLE TRIBE OF FLORIDA

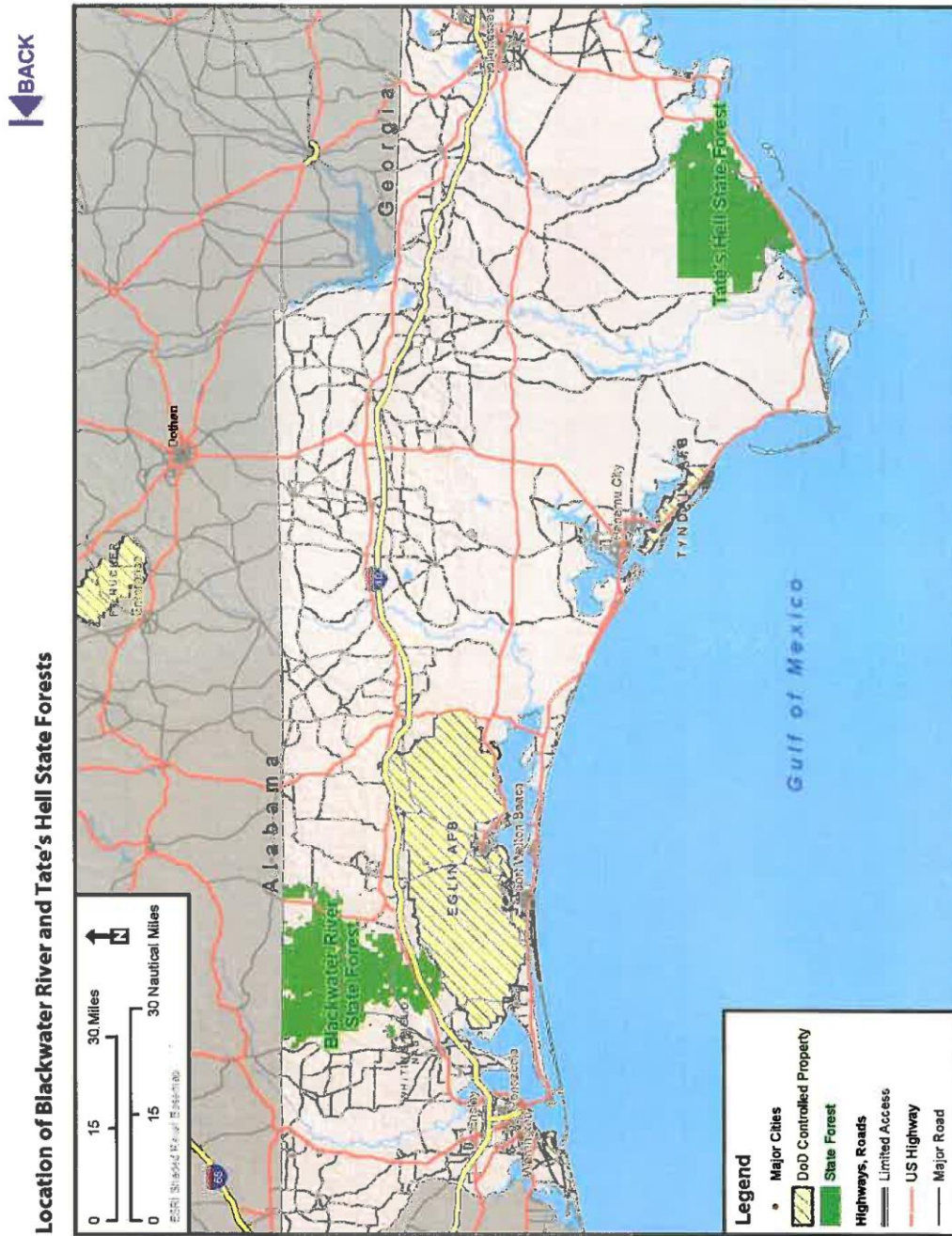
By: _____ Date: _____
Mr. James E. Billie, Chairman

THE THLOPHTLOCCO TRIBAL TOWN OF THE CREEK (MUSCOGEE) TRIBE

By: _____ Date: _____
Mr. George Scott, Town King

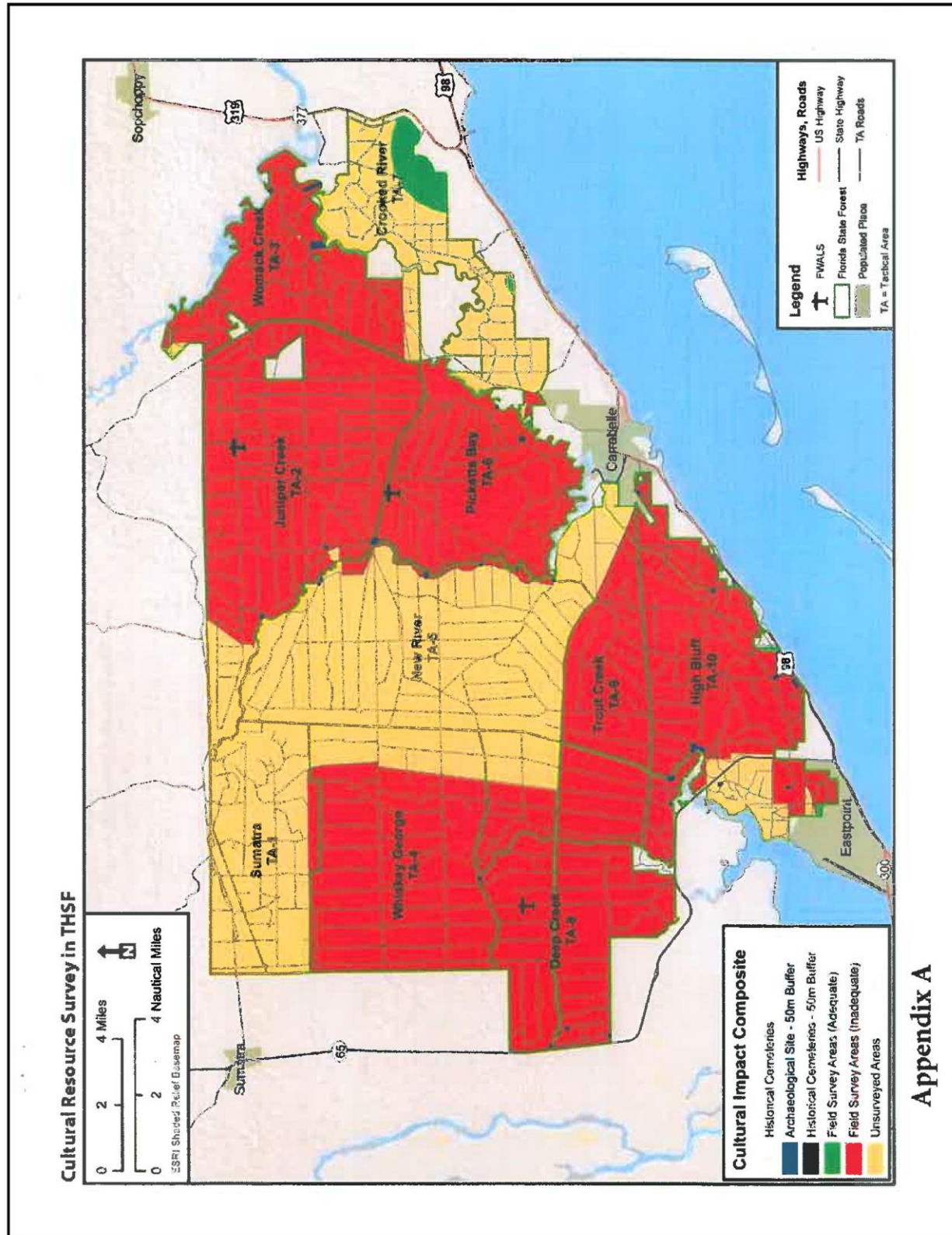
Appendix A: Maps of The Blackwater River State Forest and Tate's Hell State Forest

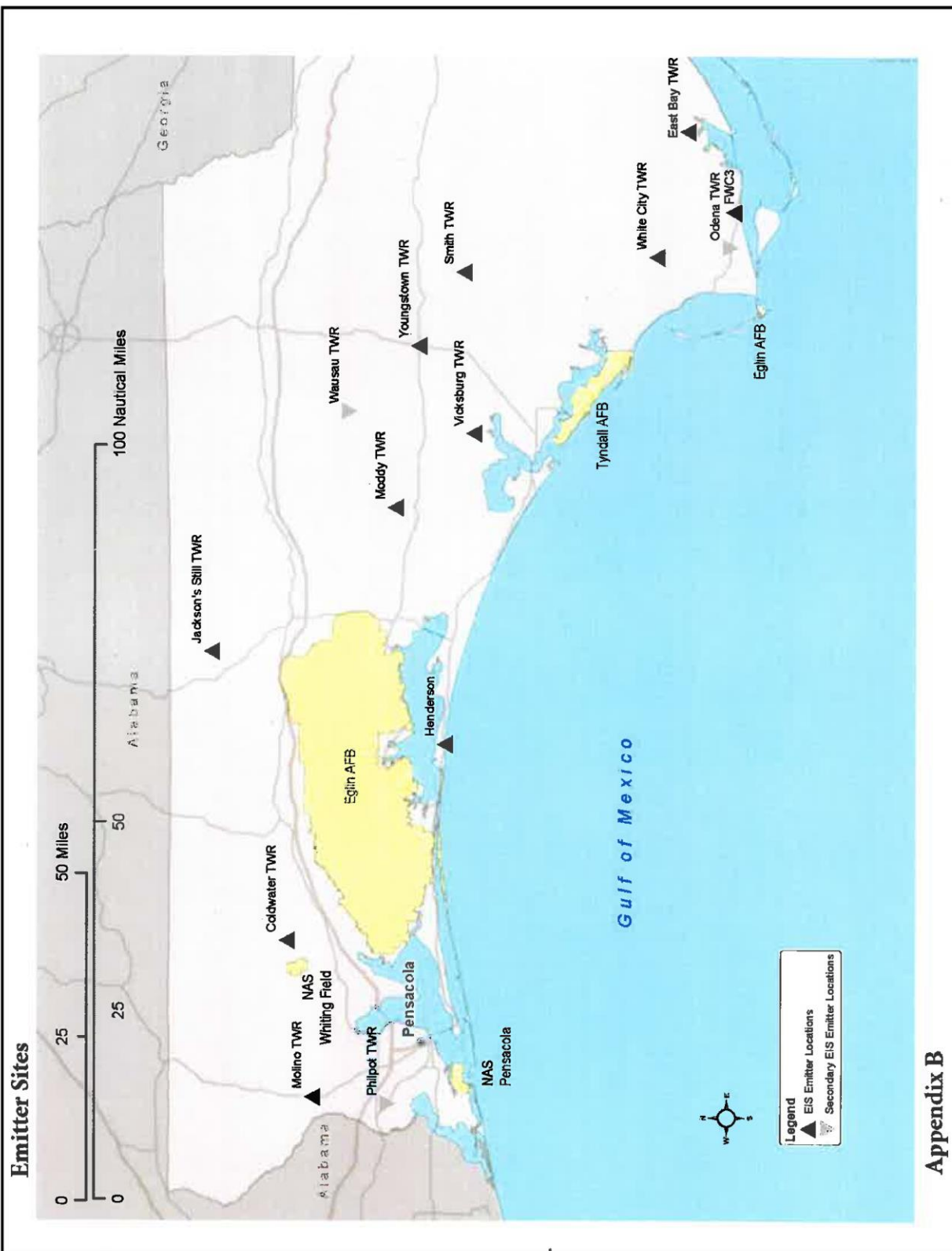
Appendix B: Map of the Radar Emitter locations



Appendix A







APPENDIX D

AIR QUALITY

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TABLE OF CONTENTS

D. AIR QUALITY D-1

 D.1 Air Quality Program Overview D-1

 D.1.1 Project Calculations D-3

 D.1.1.1 Methodology D-3

 D.1.1.1.1 Construction Emissions D-4

 D.1.1.1.2 Grading Activities..... D-4

 D.1.1.1.3 Stationary and Mobile Equipment D-5

 D.1.1.1.4 Aircraft Emissions..... D-6

 D.1.1.1.5 Munition Emissions..... D-8

 D.2 National Emissions Inventory D-9

 D.2.1 Greenhouse Gases..... D-10

 D.2.1.1 GHG Construction Emissions..... D-11

 D.2.1.1.1 GHG Personnel Emissions..... D-11

 D.2.1.1.2 GHG Operational Emissions D-11

 D.3 References D-12

List of Tables

Table D-1. Summary of National and State Ambient Air Quality Standards..... D-2

Table D-2. Aircraft and Engine Mode..... D-7

Table D-3. Aircraft Used in Worst Case Scenario Air Quality Analysis D-7

Table D-4. Munitions Emissions Factors D-8

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

A/LVL	Air/Land Vertical Lift
ACAM	Air Conformity Applicability Model
AD	Airdrops
AGL	above ground level
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH₄	methane
CO	carbon monoxide
CO₂	carbon dioxide
CO₂-e	carbon dioxide equivalents
CY	calendar year
EF	emission factor
EIS	Environmental Impact Statement
EP	pollutant emission
FARP/HGO	Forward Air Refueling Point/Hot Gas Operations
FDEP	Florida Department of Environmental Protection
FR	<i>Federal Register</i>
ft²	square feet
GHG	greenhouse gas
HAP	hazardous air pollutant
HCSU	Hardened Camp Site Use
HMMWV	high-mobility multipurpose wheeled vehicle, “humvee”
hp	horsepower
hp-hr	horsepower-hours
hr	hours
JP-8	jet fuel
LAPT	Light Aviation Proficiency Training
lb	pounds
LF	load factor
LLHI/E	Low-Level Helicopter Insertions/Extractions
LTO	landing and takeoff
mg/m³	milligrams per cubic meter
mm	millimeter
N₂O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act
NF	no factor given
NO₂	nitrogen dioxide
NO_x	nitrogen oxides
O₃	ozone
OHO	Overwater Hoist Operations
OT	operating time
Pb	lead
PM	particulate matter
PM₁₀	particulate matter with diameter less than or equal to 10 micrometers

PM_{2.5}	particulate matter with diameter less than or equal to 2.5 micrometers
ppb	parts per billion
ppm	parts per million
ROD	Record of Decision
ROI	region of influence
SAQMD	Sacramento Air Quality Management District
SCAQMD	South Coast Air Quality Management District
SO₂	sulfur dioxide
TGO	touch and go
U.S.	United States
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yr	Year
µg/m³	micrograms per cubic meter

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D. AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the state of Florida air quality program. The appendix also discusses emissions factor development and calculations, including the assumptions used for the air quality analyses presented in the Air Quality sections.

D.1 AIR QUALITY PROGRAM OVERVIEW

In order to protect public health and welfare, the United States (U.S.) Environmental Protection Agency (USEPA) has developed numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS), for six “criteria” pollutants (based on health-related criteria) under the provisions of the CAA Amendments of 1970. There are two kinds of NAAQS: primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (40 Code of Federal Regulations [CFR] 50).

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the federal program. The Division of Air Resource Management within the Florida Department of Environmental Protection (FDEP) administers the state’s air pollution control program under the authority of the Florida Air and Water Pollution Control Act and the Environmental Protection Act.

Florida has adopted the NAAQS except for sulfur dioxide (SO₂). The USEPA has set the annual and 24-hour standards for SO₂ at 0.03 parts per million (ppm) (80 micrograms per cubic meter [μg/m³]) and 0.14 ppm (365 μg/m³), respectively. Florida has adopted the more stringent annual and 24-hour standards of 0.02 ppm (60 μg/m³) and 0.1 ppm (260 μg/m³), respectively. In addition, Florida has adopted the national secondary standard of 0.50 ppm (1,300 μg/m³). Federal and state of Florida ambient air quality standards are presented in [Table D-1](#).

Based on measured ambient air pollutant concentrations, the USEPA designates areas of the U.S. as having air quality better than the NAAQS (*attainment*), worse than the NAAQS (*nonattainment*), and unclassifiable. The areas that cannot be classified (on the basis of available information) as meeting or not meeting the NAAQS for a particular pollutant are *unclassifiable* and are treated as attainment until proven otherwise. Attainment areas can be further classified as *maintenance* areas, which are areas previously classified as nonattainment but where air pollutant concentrations have been successfully reduced to below the standard. Maintenance areas are under special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS. All areas of the state are in compliance with the NAAQS. Therefore, every county within the project region of influence (ROI) is classified as being in attainment.

Table D-1. Summary of National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Federal Primary NAAQS	Federal Secondary NAAQS	Florida Standards
Carbon monoxide (CO) ¹	8-hour	9 ppm (10 mg/m ³)	No standard	9 ppm (10 µg/m ³)
	1-hour	35 ppm (40 mg/m ³)	No standard	35 ppm (40 µg/m ³)
	rolling 3-month average	0.15 µg/m ³	0.15 µg/m ³	0.15 µg/m ³
	Annual	0.053 ppm (100 µg/m ³)	0.053 ppm (100 µg/m ³)	0.053 ppm (100 µg/m ³)
Lead (Pb) ²	Annual	0.053 ppm (100 µg/m ³)	0.053 ppm (100 µg/m ³)	0.053 ppm (100 µg/m ³)
Nitrogen dioxide (NO ₂) ³	1-hour	100 ppb	No standard ⁸	100 ppb
Particulate matter with diameter less than or equal to 10 micrometers (PM ₁₀) ⁴	24-hour	150 µg/m ³	150 µg/m ³	150 µg/m ³
Particulate matter with diameter less than or equal to 2.5 micrometers (PM _{2.5}) ⁵	Annual	15 µg/m ³	15 µg/m ³	15 µg/m ³
	24-hour	35 µg/m ³	35 µg/m ³	65 µg/m ³
Ozone (O ₃) ⁶	8-hour	0.08 ppm (157 µg/m ³)	0.08 ppm (157 µg/m ³)	
Sulfur dioxide (SO ₂) ⁷	Annual	0.03 ppm (80 µg/m ³)	No standard	0.02 ppm (60 µg/m ³)
	24-hour	0.14 ppm (365 µg/m ³)	No standard	0.10 ppm (260 µg/m ³)
	3-hour	No standard	0.50 ppm ⁸	0.50 ppm
			(1,300 µg/m ³)	(1,300 µg/m ³)
	1-hour	75 ppb	No standard	No standard

Source: USEPA, 2006 (federal standards); FDEP, 2010 (Florida standards)

µg/m³ = micrograms per cubic meter; mg/m³ = milligrams per cubic meter; NAAQS = National Ambient Air Quality Standards; ppb parts per billion; ppm = parts per million

1. USEPA plans on promulgating a new carbon monoxide (CO) standard in August 2011. The current 8-hour and 1-hour averages are not to be exceeded more than once per year.

2. The new lead (Pb) standard was promulgated October 2008. the rolling 3-month average is not to be exceeded.

3. The new nitrogen dioxide (NO₂) standard was promulgated in January 2010. The official level of the standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard. The annual average is not to be exceeded. To attain the 1-hr standard, the 3-year average of the 98th percentile of the daily maximum 1-hr average at each monitor within an area must not exceed 100 ppb.

4. The PM₁₀ standard is not to be exceeded more than once per year on average over 3 years.

5. The PM_{2.5} standard was promulgated in September 2006, and a new standard is expected to be promulgated in October 2011. Until then, to attain the annual standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³. To attain the 24-hour standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³.

6. USEPA plans on promulgating a new ozone (O₃) standard July 2011. Until then, to attain the 8-hour standard, the 3-year average of the fourth highest daily maximum 8-hour average ozone concentration measured at each monitor within an area over each year must not exceed 0.075 ppm. USEPA is also currently considering a secondary standard for ozone.

7. The new sulfur dioxide (SO₂) standard was promulgated June 2010. USEPA plans to revoke the annual and 24-hour maximums 1 year after designations for the 1-hour standard occur. Until then, the annual standard is not to be exceeded, and the 24-hour maximum is not to be exceeded more than once per year. To attain the 1-hour maximum, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb. The secondary standard is not to be exceeded more than once per year, and will remain in place until a new secondary standard is established.

8. To note, USEPA is reviewing the possibility of establishing a multi-pollutant secondary standard for nitrogen oxides (NO_x) and sulfur oxides (SO_x) together, which would be promulgated by March 2010. Until then, the existing secondary standards for NO₂ and SO₂ will remain in place.

Florida has a statewide air quality monitoring network that is operated by both state and local environmental programs (FDEP, 2003). The air quality is monitored for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂). The monitors tend to be concentrated in areas with the largest population densities. Not all pollutants are monitored in all areas. The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards. Also included are areas where the ambient standards are being met, but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The end result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality, exceedances of air quality standards, and pollutant trends.

The FDEP Northwest District operates monitors in several counties, including Bay, Escambia, Holmes, Leon, Santa Rosa, and Wakulla Counties. Over the years of record, there have been exceedances (pollutant concentration greater than the numerical standard) of NAAQS. However, there has not been a violation (occurrence of more exceedances of the standard than are allowed within a specified time period) of an ambient standard (FDEP, 2003).

D.1.1 Project Calculations

D.1.1.1 Methodology

Impacts to regional air quality are determined by comparing the project emissions with the total emissions on a pollutant-by-pollutant basis for the ROI's 2008 National Emissions Inventory (NEI) data. Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The Council on Environmental Quality (CEQ) defines significance in terms of context and intensity in 40 CFR 1508.27. This requires that the significance of the action must be analyzed with respect to the setting of the Proposed Action and based relative to the severity of the impact. The CEQ National Environmental Policy Act (NEPA) Regulations (40 CFR 1508.27(b)) provide 10 key factors to consider in determining an impact's intensity.

To provide a conservative evaluation, the impacts screening in this analysis used more restrictive criteria than are required under other regulations. Rather than comparing emissions from construction activities with regional inventories, emissions were compared to the individual counties potentially impacted, which is a smaller area.

The Air Conformity Applicability Model (ACAM) version 4.4.5 was utilized to calculate grading activities by providing user inputs for each. The ACAM calculations were augmented by emissions calculations of aircraft, munitions, and vehicle (land and water craft) emissions completed in Microsoft Excel.

D.1.1.1.1 Construction Emissions

Calculations for construction emissions were completed using the calculation methodologies described in the U.S. Air Force ACAM. As previously indicated, a conformity determination is not required since Okaloosa County is designated as attainment.

The ACAM was used to provide a level of consistency with respect to emissions factors and calculations. The ACAM evaluates the individual emissions from different sources associated with the construction phases. Phase I is the site preparation phase and Phase II is the actual building/facility construction phase. These sources include grading activities, asphalt paving, construction worker trips, stationary equipment (such as saws and generators), nonresidential architectural coatings, and mobile equipment emissions (U.S. Air Force, 2003).

Airstrip expansion and clearing around airstrips would require land clearing activities. It was assumed 60,000 square feet (ft²) would be required for airstrip expansion, with 500 feet on each side of the airstrips. Based on these assumptions, the construction emissions were calculated using the methodology expressed below.

D.1.1.1.2 Grading Activities

Grading activities are divided into grading equipment emissions and grading operations emissions.

Grading equipment emissions are combustive emissions from equipment engines and are calculated in the following manner:

$$VOC = 0.22 \text{ (lb/acre/day)} * \text{acres} * DPY_1/2,000$$

$$NO_x = 2.07 \text{ (lb/acre/day)} * \text{acres} * DPY_1/2,000$$

$$PM_{10} = 0.17 \text{ (lb/acre/day)} * \text{acres} * DPY_1/2,000$$

$$CO = 0.55 \text{ (lb/acre/day)} * \text{acres} * DPY_1/2,000$$

$$SO_2 = 0.21 \text{ (lb/acre/day)} * \text{acres} * DPY_1/2,000$$

Where

acres = number of gross acres to be graded during Phase I construction

DPY₁ = number of days per year used for grading during Phase I construction

2,000 = conversion factor from pounds to tons

lb = pounds

NO_x = nitrogen oxides

PM₁₀ = particulate matter with diameter less than or equal to 10 micrometers

VOC = volatile organic compound

All emissions are represented as tons per year.

Grading operations emissions are fugitive dust and tiny soil particles distributed into the air through ground disturbance and are calculated using a similar equation from the Sacramento Air Quality Management District (SAQMD) and South Coast Air Quality Management District (SCAQMD) (U.S. Air Force, 2003). This calculation includes grading and truck hauling emissions.

Emissions calculation:

$$PM_{10} \text{ (tons/yr)} = 60.7 \text{ (lb/acre/day)} * \text{acres} * DPY_1 / 2,000$$

Where

acres = number of gross acres to be graded during Phase I construction

DPY₁ = number of days per year used for grading during Phase I construction

2,000 = conversion factor from pounds to tons

yr = year

The calculations assumed that there were no controls used to reduce fugitive emissions. Also, it was assumed that construction activities would occur within calendar year (CY) 2009 through CY 2017 (2,922 days), and that grading activities would represent 10 percent of that total, or 292 days. Construction activities not already approved in the Final Environmental Impact Statement Record of Decision (ROD) were assumed to begin in quarter three of CY 2011 and continue through CY 2017 (2,008 days). The emissions factors were derived from the SAQMD and SCAQMD (U.S. Air Force, 2003).

D.1.1.1.3 Stationary and Mobile Equipment

Emissions from generators for mobile emitters were calculated assuming six hours of operation per event, five events per week and five sites operating simultaneously. It was assumed a diesel generator would be used. Off-road vehicles (all-terrain vehicles [ATVs], motorcycles, and high-mobility multipurpose wheeled vehicles [HMMWV, "humvees"]) and watercraft emissions are calculated. The number of hours of operation varies based on the activity. Detailed information is provided in Chapter 2 for each activity type.

Each activity has the potential to use a mixture of vehicles. To determine air pollutant emissions, calculations were completed for each vehicle type specified, assuming the total number of vehicles consisted of only that vehicle. The vehicle exhibiting the highest overall emissions was chosen to represent vehicle emissions for that activity to be compared to the ROI. Thus, emissions from any mixture of vehicles would have emissions less than or equal to the emissions calculated.

The following equation was used to calculate generator and off-road vehicle emissions:

$$EP = (EF * OT * LF/100 * hp/1,000 * N)/2,000$$

Where

EP = pollutant emission (tons/yr)

EF = emission factor (lb/1,000 hp-hr)
 OT = operating time (hr)
 LF = load factor (%)
 100 = convert percentage to decimal
 hp = horsepower of generator
 2,000 = conversion factor from pounds to tons
 hp-hr = horsepower-hours
 hr = hours

D.1.1.1.4 Aircraft Emissions

Due to limited information, certain assumptions were made to develop the air quality analysis. The aircraft emissions were calculated using the proposed operation tempo outlined in Chapter 2. The sortie activities would involve CV-22, UH-60, HH-60, C-130, CH-47, C-17, Cessna 172, C-145, PC-12, M-28, and Casa-212 aircraft.

Aircraft Flying Operations

Aircraft operations of concern are those that occur from ground level up to 3,000 feet above ground level (AGL). The 3,000-foot AGL ceiling was assumed as the atmospheric mixing height above which any pollutant generated would not contribute to increased pollutant concentrations at ground level. The *aircraft operation of interest* within the mixing zone is the landing and takeoff (LTO) cycle. The LTO is characterized by five modes of operation: approach, taxi-in, taxi-out, takeoff, and climb-out. The Proposed Action and alternatives use aircraft and helicopters operating under the 3,000-foot AGL ceiling, therefore all time under the mixing height is included in the analysis.

The LTO cycle is the basis for calculating pollutant emissions. For each mode of operation during an LTO cycle, an aircraft engine operates at a specified power setting and for a specific period (time in mode). The pollutant emission rate is a function of the engine's operating mode, the fuel flow rate, and the engine's overall efficiency. Emissions for one complete LTO cycle for a particular aircraft are calculated by knowing the specific engine pollutant emissions factors for each mode of operation.

The U.S. Air Force has developed emissions factors for aircraft engines. The table lists the various engine modes, time in for each mode, fuel flow, and corresponding pollutant emissions factors. Using these data, as well as information on activity levels (i.e., number of sorties/LTO operations), pollutant emissions for each aircraft were calculated. Aircraft flying operations were calculated in MS Excel using LTO cycles. As previously described, emissions from engine exhaust occur for each operation during idle/taxi-out, takeoff, climb-out, approach, and taxi/idle-in ([Table D-2](#)). Only those portions of the flying operation that take place below the atmospheric mixing height are considered (these are the only emissions presumed to affect ground-level concentrations).

Table D-2. Aircraft and Engine Mode

Aircraft Mode	Engine Mode
Taxi/idle-out	Idle
Takeoff	Military or afterburner
Climb-out	Intermediate
Approach	Approach
Taxi/idle-in	Idle

Each activity required a different assortment of aircraft, in which any combination could be used. For the purposes of the air quality analysis, emissions were calculated assuming the maximum number of aircraft and hours of operation. The aircraft that had the highest emissions was used to compare to the ROI. The maximum number of aircraft, hours, and days of operations that were outlined in Chapter 2 were used for the analysis of air pollutant emissions per event and per year.

For example, for Light Aviation Proficiency Training (LAPT), four possible aircraft may be used (Casa-212, PC-12, C-145, and/or M-28) for a total of four aircraft operating for two hours each, five times per day. Emissions were calculated for all four aircraft types assuming that four Casa-212 would be used, or four PC-12s. Once the emissions were calculated, the aircraft exhibiting the highest emissions was chosen to represent the aircraft emissions for LAPT, with the expectation that any combination of aircraft could be used and the emission levels would be less than or equal to those shown in this analysis. [Table D-3](#) shows the aircraft used for each activity type in the air quality analysis.

Table D-3. Aircraft Used in Worst Case Scenario Air Quality Analysis

Activity	Aircraft
Light Aviation Proficiency Training (LAPT)	Casa-212
Low-Level Helicopter Insertions/Extractions (LLHI/E)	CH-47
Airdrops (AD)	C-17
Air/Land Vertical Lift (A/LVL)	CH-47
Forward Air Refueling Point/Hot Gas Operations (FARP/HGO)	CH-47
Overwater Hoist Operations (OHO)	CH-47
Hardened Camp Site Use (HCSU)	CH-47

Emissions calculation based on aircraft flying operations:

$$EP = N * F * OPS * NUMEG * (\sum TIM_i * EFi,p) / 2,000$$

Where

N = number of aircraft

F = fraction of the year the aircraft operate

OPS = the number of operations [total LTOs and touch and go (TGOs)] per year for each aircraft in the Proposed Action unit

TIM_i = time in mode for aircraft operating mode, *i*, hours

The engine operating mode used in the emissions factors is correlated to the aircraft operating mode as follows.

M = number of aircraft operating modes (five for LTOs; three for TGOs)

NUMEG = the number of engines for the aircraft type

EF_{i,p} = emissions factor for pollutant, *p*, for each engine operating mode, *i*, lb/hr

2,000 = conversion from pounds to tons

Emissions were also calculated for aircraft flying below 3,000 feet AGL while completing training operations. Using operation tables provided in Chapter 2, the amount of time an aircraft is under 3,000 feet AGL in the ROI was determined for each of the aircraft types.

D.1.1.1.5 Munition Emissions

Munition emissions for the Proposed Action and alternatives training operations were calculated using the same methodology. For all munitions, emissions factors were used to complete the analysis ([Table D-4](#)).

Emissions calculation:

$$\text{Pollutant Emissions} = EF * Qty / 2,000$$

Where

pollutant emissions = emissions for the associated pollutant (i.e., CO or NO_x) (tons/yr)

EF = emissions factor for the pollutant (lb/item)

Qty = quantity (item/year)

2,000 = conversion from pounds to tons (1 ton = 2,000 pounds)

Table D-4. Munitions Emissions Factors

Type	Emission Factor (lb/item)								
	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	VOC	CO ₂	CH ₄	N ₂ O
5.56 mm Blank	0.000	0.000	0.000	0.000	0.000	NF	0.000	0.000	NF
7.62 mm Blank	0.001	0.000	0.000	0.000	0.000	NF	0.001	0.000	NF
Ground Burst Simulators	0.002	0.005	0.192	NF	0.000	0.000	0.003	NF	NF
M-18 Smoke Grenades	0.012	0.000	0.126	0.101	0.000	0.002	0.084	NF	NF
M-18 Smoke Grenades	0.004	0.000	NF	NF	0.001	0.000	0.077	NF	NF
M-18 Smoke Grenades	0.006	0.000	0.141	0.122	0.000	0.001	0.077	NF	NF
M-18 Smoke Grenades	0.014	0.000	0.116	0.103	0.000	0.001	0.043	NF	NF

Source: USEPA, 2013

CH₄ = methane; CO = carbon monoxide; CO₂ = carbon dioxide; lb = pounds; mm = millimeter; N₂O = nitrous oxide; NF = no factor given; NO_x = nitrogen oxides; PM₁₀ = particulate matter with diameter less than or equal to 10 micrometers; PM_{2.5} = particulate matter with diameter less than or equal to 2.5 micrometers; SO₂ = sulfur dioxide; VOC = volatile organic compound

D.2 NATIONAL EMISSIONS INVENTORY

The NEI is operated under the USEPA's Emissions Factor and Inventory Group, which prepares the national database of air emissions information with input from numerous state and local air agencies, Tribes, and industries. The database contains information on stationary and mobile sources that emit criteria air pollutants and hazardous air pollutants (HAPs). The database includes estimates of annual emissions, by source, of air pollutants in each area of the country on a yearly basis. The NEI includes emissions estimates for all 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands. Emissions estimates for individual point or major sources (facilities), as well as county-level estimates for area, mobile, and other sources, are currently from an extract of USEPA's NEI database. Data were extracted in August 2005 (1999 emissions) and August 2008 (2002 emissions).

Criteria air pollutants are those for which the USEPA has set health-based standards. Four of the six criteria pollutants are included in the NEI database:

- CO
- NO_x
- SO₂
- PM₁₀ and particulate matter with diameter less than or equal to 2.5 micrometers (PM_{2.5})

The NEI also includes emissions of VOCs, which are ozone precursors, emitted from motor vehicle fuel distribution and chemical manufacturing, as well as other solvent uses. VOCs react with NO_x in the atmosphere to form O₃. The NEI database defines three classes of criteria air pollutant sources:

- *Point sources.* Stationary sources of emissions, such as an electric power plant, that can be identified by name and location. A “major” source emits a threshold amount (or more) of at least one criteria pollutant and must be inventoried and reported. Many states also inventory and report stationary sources that emit amounts below the thresholds for each pollutant.
- *Area sources.* Small point sources such as a home or office building or a diffuse stationary source such as wildfires or agricultural tilling. These sources do not individually produce sufficient emissions to qualify as point sources. Dry cleaners are one example; for instance, a single dry cleaner within an inventory area typically will not qualify as a point source, but collectively the emissions from all of the dry cleaning facilities in the inventory area may be significant and therefore must be included in the inventory.
- *Mobile sources.* Any kind of vehicle or equipment with a gasoline or diesel engine (such as an airplane or ship).

The following are the main sources of criteria pollutant emissions data for the NEI:

- For electric generating units, USEPA's Emissions Tracking System/Continuous Emissions Monitoring Data and Department of Energy fuel use data.
- For other large stationary sources, state data and older inventories where state data were not submitted.
- For on-road mobile sources, the Federal Highway Administration's estimate of vehicle miles traveled and emissions factors from USEPA's MOBILE Model.
- For non-road mobile sources, USEPA's NONROAD Model.
- For stationary area sources, state data, USEPA-developed estimates for some sources, and older inventories where state or USEPA data were not submitted.
- State and local environmental agencies supply most of the point source data. USEPA's Clean Air Market program supplies emissions data for electric power plants.

D.2.1 Greenhouse Gases

Greenhouse gases (GHGs) are chemical compounds in the Earth's atmosphere that trap heat. Gases exhibiting greenhouse properties come from both natural and human sources. Water vapor, carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) are examples of GHGs that have both natural and man-made sources, while other gases such as those used for aerosols are exclusively man-made. In the U.S., GHG emissions come mostly from energy use. These are driven largely by economic growth, fuel used for electricity generation, and weather patterns affecting heating and cooling needs.

Typically, GHG emissions are represented as CO₂ equivalents (CO₂-e) based on the molecule's global warming potential or ability to trap heat in the atmosphere relative to CO₂ (USEPA, 2005). Therefore, all GHG emissions calculations and analysis in this document are represented in CO₂-e.

The USEPA has recently promulgated several final regulations involving GHGs, either under the authority of the CAA, or as directed by Congress, but none of them apply directly to the Proposed Action. However, Eglin AFB may be required to adjust their Title V Air Operating Permit under the *Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule*, 75 *Federal Register (FR)* 31514, 3 June 2010. Likewise, Eglin has already prepared a *Greenhouse Gas Baseline Emissions Inventory* (U.S. Air Force, 2010a) and will be required to report annual emissions to USEPA under *Mandatory Reporting of Greenhouse Gases*, 74 *FR* 56260, 30 October 2009. As an affected facility, Eglin has prepared a *Greenhouse Gas Monitoring Plan* (U.S. Air Force, 2010b).

The potential effects of GHG emissions from the Proposed Action are by nature global. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, the GHG emissions from the No Action Alternative and the Proposed Action and

alternatives have been quantified to the extent feasible in this Environmental Impact Statement (EIS) for information and comparative purposes.

D.2.1.1 GHG Construction Emissions

Combustion of fossil fuels by construction equipment and constructions workers' vehicles during commutes to and from the site would contribute to increased GHG emissions. Construction equipment emits approximately 22.2 pounds of CO₂ per gallon of diesel and worker vehicles emit 19.4 pounds of CO₂ per gallon of gasoline (USEPA, 2009b). These emission rates can be decreased with less idling and improved maintenance of equipment. It was assumed that construction vehicles would operate for approximately 1,248 hours annually. Of 250 potential working days, 62.5 percent (or 157 days) are suitable for construction activities (i.e., no precipitation) (Sperling's Best Places, 2010). These vehicles were assumed to each combust 4 gallons of diesel per hour (Fusetti and Monahan, 2008).

Stationary sources for construction were also included in the analysis. It was assumed that a number of small diesel-fueled generators would be operated during working hours. Each generator was assumed to combust 1 gallon per hour of operation.

It was assumed that construction workers would be required to commute each day for 157 work days. ACAM estimates the average commute to be 15 miles one way, and 23.9 miles per gallon average was assumed for commuter vehicles (USEPA, 2009b).

D.2.1.1.1 GHG Personnel Emissions

The addition of personnel to the region would also lead to increased GHG emissions. The two primary sources for these GHG emissions would be mobile emissions from added personnel commutes, and emissions in the home from personnel running home heating and cooling and other electrical devices. Commuter emissions were calculated using the same methodology as for the construction workers above. The USEPA estimates that in the U.S., approximately 4 metric tons of CO₂-e are produced per person per year in the home (USEPA, 2010b).

D.2.1.1.2 GHG Operational Emissions

Combustion of fuels during flight operations would also cause GHG emissions. Emissions were calculated using fuel flow rates for the respective aircraft. The emissions factor for jet fuel (JP-8) is 22.1 pounds CO₂-e per gallon of fuel, respectively (U.S. Air Force, 2009). Calculations were based on the estimated annual sorties for each aircraft under each alternative as discussed in Chapter 2 of the EIS.

GHG emissions from munitions use were calculated using emissions factors on a per item basis as outlined in AP-42 (USEPA, 2009a). Munitions to be used under each alternative as well as numbers for each munition type are listed in Chapter 2 of the EIS.

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APPENDIX E

EARTH RESOURCES

TABLE OF CONTENTS

E. EARTH RESOURCES.....E-1

 E.1 Soils Summaries.....E-1

 E.1.1 Blackwater River State Forest SoilsE-1

 E.1.2 Tate’s Hell State Forest SoilsE-7

 E.2 ReferencesE-11

List of Tables

Table E-1. Blackwater River State Forest Soils Summary E-1

Table E-2. Tate’s Hell State Forest Soils Summary E-7

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E. EARTH RESOURCES

E.1 SOILS SUMMARIES

E.1.1 Blackwater River State Forest Soils

Table E-1. Blackwater River State Forest Soils Summary

Soil Taxonomy Class	Description	Tactical Area (acres)									
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	Total
1 Entisols Soil Order	Entisols are soils that have little or no evidence of the development of soil horizons. Some of these soils are on steep, actively eroding slopes, and others are on floodplains or glacial outwash plains that receive frequent deposits of alluvium sediments. Entisols consist mostly of quartz or other minerals that are resistant to the weathering.	7,117	7,032	354	621	2,800	4,500	1,848	8,488	8,712	41,472
1A Aquents Soil Suborder	Aquents are stratified, nearly level, wet Entisol soils that formed in recent sandy sediments along stream floodplains, margins of lakes, and deltas of middle and low latitudes. Soil stratification results from sediment deposition caused by changing stream currents and shifting channels. In humid areas, these soils are extensive along large rivers. Water table levels generally fluctuate from near or above the soil surface to about 40	6,711	3,778	0	0	2,374	2,646	575	2,450	164	18,698

Table E-1. Blackwater River State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)									
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	Total
	inches below the soil surface.										
1A1 Soil Series	Bibb-Kinston Association, coarse-loamy sand, frequent flooding										
1B Psamments Soil Suborder	Psamments are the sandy Entisols that formed in poorly graded marine, eolian, or fluvial sand deposits on hillslope, knoll, ridge, and floodplain terraces, sand dunes, in cover sands, or in sandy parent materials. Soils formed in sandy sediments sorted by water are on outwash plains, lake plains, stream floodplains, marine terraces, natural levees, or beaches. Psamments are on surfaces of virtually any geologic formation from recent to Pliocene or older. These soils have a relatively low water-holding capacity, and the water table is typically deeper than 20 inches. Psamments that are bare and dry are subject to soil blowing and drifting and cannot easily support wheeled vehicles.	407	3,254	354	621	426	1,855	1,272	6,038	8,548	22,775
1B1 Soil Series	Chipleigh and Hurricane soils, sand, 0 to 5 percent slopes; Lakeland, sand, 0 to 30 percent slopes; Pactolus, loamy sand, 0 to 5 percent slopes; Foxworth, sand, 0 to 5 percent slopes; Ortega, sand, 0 to 5 percent slopes; Resota, sand, 0 to 5 percent slopes										
2 Histisols Soil Order	Histisols are soils that formed in organic soil materials and are frequently referred to as mucks or peat soils. The primary source of organic matter is the decomposed plant materials that accumulate in water.	—									

Table E-1. Blackwater River State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)									
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	Total
	These soils occur in floodplains, hardwood swamps, flatwoods depressions, and coastal bays and marshes. The poorly drained Histosols occur on level to nearly level slopes of less than 1 percent.										
2A Saprist Soil Suborder	Saprist soils are the wet Histosols in which the organic materials are well decomposed. They consist of the residue that remains after the aerobic decomposition of organic matter. Saprist soils occur in areas where the ground water table tends to fluctuate within the soils or in areas where the soils were aerobic during drier periods in the past.	30	77	229	18	22	0	617	222	969	2184
2A1 Soil Series	Dorovan, muck, frequent flooding; Dorovan-Pamlico Association, muck, frequent flooding										
3 Inceptisols Soil Order	Inceptisols are soils that have experienced some change in parent materials resulting in the leaching and accumulation of materials in subsurface layers or horizons. Inceptisols form mainly in loamy and clayey parent materials. This soil order includes a wide variety of soil types. These soils range from very poorly drained to excessively drained and frequently occur on level to gently undulating floodplain and marsh areas. Many of these soils formed in late-Pleistocene glacial	—									

Table E-1. Blackwater River State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)									
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	Total
	drift.										
3A Aquepts Soil Suborder	Aquepts are the wet Inceptisols that have poor to very poor natural drainage. If the soils have not been artificially drained, ground water is at or near the soil surface at some time during normal years but typically not at all seasons. Most Aquepts formed in late-Pleistocene or younger deposits in depressions, on nearly level plains, or floodplains.	6	99	5,243	1,974	9	0	2,017	54	582	9,984
3A1 Soil Series	Kinston, Johnston, and Bibb soils, coarse-loamy, frequent flooding; Rutlege, fine sand, depressional, frequent flooding; Rutlege, loamy sand, frequent flooding										
4 Spodosols Soil Order	Spodosols are poorly drained, naturally infertile soils in which materials such as organic matter, aluminum, and/or iron have leached through the soil profile and accumulated in a lower layer in the soil profile, called a spodic horizon. The soil texture class of these soils is mostly sandy, sandy-skeletal, coarse-loamy, loamy-skeletal, or coarse silty and is black or red in appearance. In northwest Florida, they primarily occur in quartz-rich sands of acidic marine sediments with fluctuating ground water levels, which typically include flatwoods, depressions, stream terraces, and tidal areas. Slopes typically range from 0										

Table E-1. Blackwater River State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)									
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	Total
	to 5 percent.										
4A Aquods Soil Suborder	Aquods are the Spodosols of wet regions that are generally characterized by a fluctuating, shallow water table. These soils have aquic conditions for some time in normal years in one or more horizons within 20 inches of the soil surface. Aquods formed in sandy materials of Pleistocene age.	0	0	0	0	5	0	0	0	0	5
4A1 Soil Series	Leon, sand, common flatwoods soil, 0 to 2 percent										
5 Ultisols Soil Order	Ultisols are highly developed and leached soils in which clay has accumulated in a lower soil layer called the argillic horizon. Most surface layers have a sandy or loamy soil texture, and subsurface horizons typically have a loamy or clayey texture. They are mainly on Pleistocene or older surfaces. These excessively to poorly drained soils formed in loamy marine and alluvial deposits that occur on upland terraces, flats, ridges, hillslopes, drainways, depressions, and interstream divides that range from nearly level to slopes of 30 percent or greater	27,256	28,383	26,488	8,805	13,172	19,757	11,485	13,450	1,681	150,477

Table E-1. Blackwater River State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)									
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	Total
5A Aquults Soil Suborder	Aquults are the Ultisols in wet areas where ground water is very close to the surface during part of each year, usually in winter and spring in middle latitudes, and is deep at another time. These gently sloping soils formed mainly in alluvium and marine deposits that are of Pleistocene age or older.	0	0	1,767	98	0	0	1,393	3	420	3,681
5A1 Soil Series	Yemassee, Garcon, and Bigbee soils, loamy, occasional flooding										
5B Udults Soil Suborder	Udults are the more or less freely drained, humus-poor Ultisols that have a udic moisture regime. Some have a fragipan or plinthite, or both, in or below the argillic or kandic horizon. Udults developed in sediments and on surfaces that range from late Pleistocene to Pliocene or possibly older. Most of these soils have or had forest vegetation, but some have a savanna that probably is anthropic.	27,256	28,383	24,721	8,707	13,172	19,757	10,092	13,477	1,261	146,826
5B1 Soil Series	Albany, loamy sand, rare flooding, 0 to 5 percent slopes; Angie, sandy loam, rare flooding, 2 to 5 percent slopes; Angie, variant loam, rare flooding; Bonifay sand, 0 to 5 percent; Bonifay, loamy sand, 0 to 8 percent slopes; Bonifay-Dothan-Angie complex, 5 to 12 percent slopes; Dothan, loamy sand, 0 to 8 percent slopes; Dothan, fine sandy loam, 0 to 8 percent slopes; Escambia, fine sandy loam, 0 to 3 percent slopes; Esto, loam, 2 to 8 percent slopes; Fuquay, loamy sand, 0 to 8 percent slopes; Johns, fine sandy loam, 0 to 3 percent slopes; Kalmia, loamy fine sand, rare flooding, 2 to 5 percent slopes; Leefield-Stilson complex, loamy, 0 to 5 percent slopes; Lucy, loamy sand, 0 to 8 percent slopes; Lynchburg, fine sandy loam, 0 to 2 percent slopes; Maxton, loamy fine sand, rarely flooded, 2 to 5 percent slopes; Notcher, gravelly sandy loam, 0 to 5 percent slopes; Orangeburg, sandy loam, 0 to 8 percent slopes; Pansey, fine sandy loam, 1 to 3 percent slopes; Pansey, sandy loam, depression, frequent flooding; Rains, sandy loam, occasional flooding; Tifton, sandy loam, 0 to 8 percent slopes; Troup, loamy sand, 0 to 12 percent slopes; Troup, sand, 0 to 12 percent slopes; Troup-Orangeburg-Cowarts complex, loamy, 5 to 12 percent slopes										

Sources: USDA, 2010; USDA, 1995; USDA, 1980

Soil hydric rating: **Hydric** (blue); **Not Hydric** (green)

Flooding frequency: Frequent – > 50 times in 100 years; Occasional – >5 to 50 times in 100 years; Rare – 1 to 5 times in 100 years

Note: To convert acres to hectares, multiply by 0.4047; to convert inches to centimeters, multiply by 2.54.

E.1.2 Tate's Hell State Forest Soils

Table E-2. Tate's Hell State Forest Soils Summary

Soil Taxonomy Class	Description	Tactical Area (acres)										Total
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	TA-10	
1 Alfisols Soil Order	Alfisols are soils that have an ochric epipedon, an argillic horizon, and moderate to high base saturation and in which water is held at less than 1,500 kPa tension during at least 3 months each year. Alfisols frequently have fragipan, duripan, plinthite, or other restrictive soil layers that may result in perched water tables. Many Alfisols have aquic conditions.											
1A Aqualfs Soil Suborder	Aqualfs are Alfisols that have aquic conditions for some time in normal years at or near the surface. In some soils, ground water fluctuates from near the surface for most of the year then drops to greater depths. In others, the ground water may be deep most of the year, but restrictive soil layers limit the downward water movement, creating perched water tables. The wetness of a few Aqualfs is from seepage.	515	18,813	3,126	44	5,531	3,144	67	0	2,292	2,738	36,270
1A1 Soil Series	Ellore, Bibb, and Meggett soils, 0 to 3 percent slopes, frequent flooding; Goldhead, sand; Goldhead-Meadowbrook complex, depressional; Harbeson, mucky loamy sand, depressional; Meadowbrook, sand, 0 to 2 percent slopes; Meadowbrook, sand, slough, frequent flooding; Meadowbrook, Meggett, and Tooles soils, frequent flooding; Tooles, sand, 0 to 1 percent slopes; Tooles-Meadowbrook complex, depressional											
2 Entisols Soil Order	Entisols are soils that have little or no evidence of the development of soil horizons – most soils lack a subsoil. Some of these soils are on steep, actively eroding slopes, and others are on floodplains or glacial outwash plains that receive new deposits of alluvium at frequent intervals. Entisols consist mostly of quartz or other minerals that are resistant to the weathering needed to form horizons.	88	4,681	5,277	6,798	9,569	4,559	4,167	8,713	13,502	8,510	65,864
2A Aquents Soil Suborder	Aquents are stratified, nearly level, wet Entisol soils that formed in recent sandy sediments along stream floodplains, margins of lakes, and deltas of middle and low latitudes. Soil stratification results from sediment deposition caused by changing stream currents and shifting channels. In humid areas, these soils are extensive along large rivers. Water table levels generally fluctuate from near or above the soil surface to about 40 inches below the soil surface.	0	0	0	0	41	460	201	15	0	454	1171
2A1 Soil Series	Bohicket and Tisonia soils, tidal, frequent flooding; Chowan, Brickyard, and Kenner soils, frequent flooding											

Table E-2. Tate's Hell State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)										Total
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	TA-10	
2B Psamments Soil Suborder	Psamments are the sandy Entisols that formed in poorly graded marine, eolian, or fluvial sand deposits on hillslope, knoll, ridge, and floodplain terraces, sand dunes, in cover sands, or in sandy parent materials. Soils formed in sandy sediments sorted by water are on outwash plains, lake plains, stream floodplains, marine terraces, natural levees, or beaches. Psamments are on surfaces of virtually any geologic formation from recent historic to Pliocene or older. These soils have a relatively low water-holding capacity and the water table is typically deeper than 20 inches. Psamments that are bare and dry are subject to soil blowing and drifting and cannot easily support wheeled vehicles.	88	4,681	5,277	6,798	9,528	4,100	3,966	8,697	13,502	8,056	56,645.056
2B1 Soil Series	Bonsai, mucky fine sand, frequent flooding; Corolla, sand, rare flooding, 0 to 5 percent slopes; Chipley-Foxworth complex, 0 to 5 percent slopes; Duckston, sand, occasional flooding; Kureb, fine sand, 3 to 8 percent slopes; Osier, sand; Ortega, fine sand, 0 to 5 percent slopes; Resota, fine sand, 0 to 5 percent slopes; Ridgewood, sand, 0 to 5 percent slopes; Scranton, fine sand, 0 to 2 percent slopes; Scranton, loamy sand, slough, frequent flooding											
3 Histosols Soil Order	Histosols are soils that formed in organic soil materials and are frequently referred to as mucks or peat soils. The primary source of organic matter is the decomposed plant materials that accumulate in water. These soils occur in floodplains, hardwood swamps, flatwoods depressions, and coastal bays and marshes. The poorly drained Histosols occur on level to nearly level slopes of less than 1 percent.	—										
3A Saprists Soil Suborder	Saprists are the wet Histosols in which the organic materials are well decomposed. They consist of the residue that remains after the aerobic decomposition of organic matter. Saprists occur in areas where the ground water table tends to fluctuate within the soils or in areas where the soils were aerobic during drier periods in the past.	271	9	2,799	52	70	396	2,180	65	232	1,553	7,627
3A1 Soil Series	Dirego and Bayvi soils, tidal, frequent flooding; Dorovan-Pamlico association, muck, frequent flooding; Maurepas, muck, frequent flooding; Pamlico-Pickney complex, frequent flooding											
4 Inceptisols Soil Order	Inceptisols are soils that have experienced some change in parent materials resulting in the leaching and accumulation of materials in subsurface layers or horizons. Inceptisols form mainly in loamy and clayey parent materials. This soil order includes a wide variety of soil types. These soils range from very poorly drained to excessively drained and	—										

Table E-2. Tate's Hell State Forest Soils Summary, Cont'd

Soil Taxonomy Class	Description	Tactical Area (acres)										Total
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	TA-10	
	frequently occur on level to gently undulating floodplain and marsh areas. Many of these soils formed in late-Pleistocene glacial drift. Soil textures range from sandy loams to silty clays.											
4A Aquepts Soil Suborder	Aquepts are wet Inceptisols that have poor to very poor natural drainage. If the soils have not been artificially drained, ground water is at or near the soil surface at some time during normal years but typically not at all seasons. Most Aquepts formed in late-Pleistocene or younger deposits in depressions, on nearly level plains, or on floodplains.	164	4,086	1,506	4,075	5,124	7,277	3,560	5,842	3,944	4,593	40,171
4A1 Soil Series	Pickney-Pamlico complex, depressional; Rutlege, fine sand, 0 to 2 percent slopes; Rutlege and Plummer soils, depressional; Rutlege, loamy fine sand, depressional; Rutlege, Bibb, and Surrency soils, frequent flooding; Torhunta-Lynn Haven-Croatan complex, frequent flooding											
5 Spodosols Soil Order	Spodosols are poorly drained, naturally infertile soils in which materials such as organic matter, aluminum, and/or iron have leached through the soil profile and accumulated in a lower layer in the soil profile called a spodic horizon. The soil texture class of these soils is mostly sandy, sandy-skeletal, coarse-loamy, loamy-skeletal, or coarse silty and is black or red in appearance. In northwest Florida, they primarily occur in quartz-rich sands of acidic marine sediments with fluctuating groundwater levels, which typically include flatwoods, depressions, stream terraces, and tidal areas. Slopes typically range from 0 to 5 percent.	1,013	1,851	966	1,612	4,727	1,247	3,203	979	933	5,381	21,912
5A Aquods Soil Suborder	Aquods are the Spodosols of wet regions that are generally characterized by a fluctuating, shallow water table. These soils have aquic conditions for some time in normal years in one or more horizons within 20 inches of the soil surface. Aquods formed in sandy materials of Pleistocene age.	1,010	1,829	927	1,612	4,727	1,244	2,901	977	814	4,278	20,319
5A1 Soil Series	Chaires, sand, 0 to 2 percent slopes; Leon, sand, 0 to 2 percent slopes; Lynn Haven, sand, 0 to 2 percent slopes; Pottsburg, sand, 0 to 2 percent slopes; Sapelo, sand, 0 to 2 percent slopes											
5B Orthods Soil Suborder	Orthods are relatively freely drained the Spodosols with a horizon accumulation containing aluminum, or aluminum and iron, and organic carbon. They formed predominantly in coarse, acid Pleistocene or Holocene deposits under mostly coniferous forest vegetation. If undisturbed, Orthods normally have an O, an albic, and a spodic horizon and may have a	3	21	40	0	0	4	302	2	118	1,103	1,593

Table E–2. Tate’s Hell State Forest Soils Summary, Cont’d

Soil Taxonomy Class	Description	Tactical Area (acres)										Total
		TA-1	TA-2	TA-3	TA-4	TA-5	TA-6	TA-7	TA-8	TA-9	TA-10	
	fragipan.											
5B1 Soil Series	Hurricane, sand, 0 to 3 percent slopes; Hurricane, Leon, and Albany soils, 0 to 4 percent slopes; Mandarin, fine sand, 0 to 3 percent slopes											
5 Ultisols Soil Order	Ultisols are highly developed and leached soils in which clay has accumulated in a lower soil layer called the argillic horizon. Most surface layers have a sandy or loamy soil texture, and subsurface horizons typically have a loamy or clayey texture. They are mainly on Pleistocene or older surfaces. These excessively to poorly drained soils formed in loamy marine and alluvial deposits that occur on upland terraces, flats, ridges, hillslopes, drainways, depressions, and interstream divides that range from nearly level to slopes of 30 percent or greater	12,765	1,814	234	12,204	4,121	123	121	931	126	0	32,439
5A Aquults Soil Suborder	Aquults are the Ultisols in wet areas where ground water is very close to the surface during part of each year, usually in winter and spring in middle latitudes, and is deep at another time. These gently sloping soils formed mainly in alluvium and marine deposits that are of Pleistocene age or older.	12,185	1,690	80	12,063	4,024	96	99	923	118	0	31,278
5A1 Soil Series	Lynchburg, loamy sand, 0 to 2 percent slopes; Plummer and Pelham soils, 0 to 1 percent slopes; Plummer, fine sand, 0 to 5 percent slopes; Plummer, Sapelo, and Pottsburg soils, 0 to 2 percent slopes; Surrency, fine sand, 0 to 2 percent slopes; Surrency, Pantego, and Croatian soils, depressional; Woodington, loamy sand, 0 to 2 percent slopes											
5B Udults Soil Suborder	Udults are the more or less freely drained, humus-poor Ultisols that have an udic moisture regime. Some have a fragipan or plinthite, or both, in or below the argillic or kandic horizon. Udults developed in sediments and on surfaces that range from late Pleistocene to Pliocene or possibly older. Most of these soils have or had forest vegetation, but some have a savanna that probably is anthropic.	580	124	155	141	96	27	23	9	8	0	1163
5B1 Soil Series	Albany, loamy sand, rare flooding, 0 to 5 percent slopes; Blanton, sand, 0 to 5 percent slopes; Goldsboro, loamy sand, 0 to 5 percent slopes; Leefield, loamy sand, 0 to 5 percent slopes; Leefield, sand, 0 to 3 percent slopes; Pelham, sand, 0 to 2 percent slopes; Stilson, fine sand, 0 to 3 percent slopes; Lynchburg, fine sandy loam, 0 to 2 percent slopes											

Sources: USDA 2010, USDA 1994; kPa = kilopascals

Soil hydric rating: **Hydric** (blue); **Not Hydric** (green)

Flooding frequency: Frequent – > 50 times in 100 years; Occasional – >5 to 50 times in 100 years; Rare – 1 to 5 times in 100 years

Note: To convert acres to hectares, multiply by 0.4047; inches to centimeters, multiply by 2.54

E.2 REFERENCES

- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), 1995. *Okaloosa County Soil Survey*. National Cooperative Soil Survey, June. Retrieved from http://soils.usda.gov/survey/online_surveys/florida/#okaloosa1995, on 4 June 2013.
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), 2010. *Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys*. Retrieved from ftp://ftp-fc.sc.egov.usda.gov/NSSC/Soil_Taxonomy/keys/2010_Keys_to_Soil_Taxonomy.pdf, on 4 June 2013.
- U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS), 1980. *Santa Rosa County Soil Survey*. National Cooperative Soil Survey. May. Retrieved from http://soils.usda.gov/survey/online_surveys/florida/#santa1980, on 4 June 2013.
- U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS), 1994. *Franklin County Soil Survey*. National Cooperative Soil Survey. February. Retrieved from http://soils.usda.gov/survey/online_surveys/florida/#franklin1994, on 4 June 2013.

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APPENDIX F

CULTURAL RESOURCES

Table of Contents

F. CULTURAL RESOURCES.....F-1

F.1 Survey Reports in Blackwater State ForestF-1

F.2 Archaeological Sites in Blackwater State Forest.....F-6

F.3 Survey Reports in Tate’s HellF-39

F.4 Archaeological Sites in Tate’s Hell.....F-42

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F. CULTURAL RESOURCES

F.1 SURVEY REPORTS IN BLACKWATER STATE FOREST

Survey Reports in Blackwater State Forest			
Title	Publication Date	Author	TA
Blackwater River State Forest Well Survey	1977	Stoutamire, James W.	TA-2
Archaeological Site Assessment Survey of the Cedar Creek RC&D Project	1978	Chance, Marsha A. and George Percy	TA-2
A Cultural Resources Survey of the Zachary-Fort Lauderdale Pipeline Construction and Conversion Project: Alternate II/Florida	1980	Voellinger, Leonard and Melissa Voellinger	TA-4
Cultural Resources Survey of Alabama Electric Cooperative Inc., Munson Substation, Blackwater River State Forest	1981	Clute, Janet R. and Nicholas Holmes	TA-1
Archaeological and Historical Survey of Two Proposed Borrow Pits	1977	Spillan, Herbert J. and Robert Williams	TA-3
Cultural Resource Reconnaissance of the Baker-Beda Transmission Line, Okaloosa County, Florida and Covington County, Alabama	1981	Clute, Janet R. and Nicholas Holmes	TA-4
Cultural resources reconnaissance Tenneco Oil Co. proposed drilling operations, Blackwater River State Forest, Okaloosa County, Florida.	1983	Dejarnette, David L.	TA-8
Cultural resources survey of a proposed road and well pad, Santa Rosa County, Florida	1988	Thomas, Prentice M., Jr.	TA-2
A Cultural Resources Investigation for the Yellow River Seismic Study: GIS Lines 1, 2 and 3A, Santa Rosa County, Florida. [Confidential per F. S. 377.2409; in BHP/CR]	1988	Mikell, Gregory A.	TA-8
An Archaeological Survey of the Teledyne	1988	Mikell, Gregory	TA-7

Survey Reports in Blackwater State Forest			
Title	Publication Date	Author	TA
Exploration Company Seismic Testing Lines DNR No. G-100-88, Blackwater State Forest, Santa Rosa and Okaloosa Counties. [Confidential per F. S. 377.2409; in BHP/CR]		A.	
Management summary, Phase I cultural resources survey, Eglin Air Force Base, Florida.	1983	New World Research, INC.	TA-9
Cultural resources investigations at Eglin Air Force Base, Santa Rosa, Okaloosa and Walton Counties, Florida.	1984	New World Research, INC.	TA-9
An archaeological survey of the proposed Tommy Steele Road Project, Okaloosa County, Florida.	1990	Thomas, Prentice M., Jr.	TA-3
An archaeological survey of a proposed drill site in Blackwater State Forest, Santa Rosa County, Florida.	1990	Campbell, L. Janice and Prentice Thomas	TA-7
Phase III Archaeological Survey of the Blackwater River Drainage	1991	Penton, Daniel T.	TA-6
Historic Building Survey of Okaloosa County	1992	Bennett, Robert B., JR.	TA-8
Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida	1992	McKenzie, C. Lee and John Phillips	TA-8
Eglin Air Force Base, Historic Preservation Plan, Technical Synthesis of Cultural Resources Investigations at Eglin Santa Rosa, Okaloosa, and Walton Counties, Florida, Vol. 1: Text; Vol. 2, Technical Synthesis and Appendices; Vol. 3; Folios.	1993	Campbell, L. Janice and Prentice Thomas	TA-9
Phase I Cultural Resources Investigation of Proposed Access Roads Within the Florida Portion of the Proposed Florida Gas Transmission Company Phase III Expansion Project Pipeline Corridor [Draft Report]	1994	Berkin, Jon, Bridget Donnelly and Peter Lambousy	TA-4
Phase I C.R.I. of the 453.18 KM (281.60 MI) Florida	1993	Athens, William	TA-4

Survey Reports in Blackwater State Forest			
Title	Publication Date	Author	TA
Portion on the Proposed F.G.T. Company Phase III Expansion Project Vol. I-II;Appe.I Site Maps, III's; Photo's; A.II, Vol.I Materials by FMSF No.;A.III, VOL.II Mt. by Rec.no.; App.III Site Forms		P., Charlotte Donald and Thomas Fenn	
A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa Counties, Florida	2000	Mikell, Gregory A.	TA-9
Addendum Cultural Resource Assessment Survey/ Section 106 Review; Replacement Cellular Tower: Santa 17096-003-024; 11650 Munson Highway, Santa Rosa County, Florida	2002	PRACHT, JODI B.	TA-6
Cultural Resources Survey of the Northwest Florida Water Management District Sand and Gravel Aquifer Test Site In Blackwater River State Forest, Okaloosa County, Florida	2003	Mikell, Gregory A.	TA-7
Cultural Resource Assessment Survey of the Blackwater River State Forest Road Improvement Project	2004	Phillips, John C., and White, Sarah E.	TA-4
Phase I Cultural Resources Survey of the Proposed 319 Waiver Requests, Blackwater River State Forest, Okaloosa County, Florida	2005	Phillips, John C. and Cindy Sommerkamp	TA-3
An Archaeological and Historical Survey of the Wilderness Landing Project Area in Okaloosa County, Florida	2005	Quinn, Lisa N	TA-7
Phase I Cultural Resources Survey of the Equestrian Trailhead in the Blackwater River State Forest, Santa Rosa County, Florida	2005	Phillips, John C. and Cindy Sommerkamp	TA-8
Phase I Cultural Resources Survey of the Proposed Lawrence Cooley Road Paving Project in the Blackwater River State Forest Santa Rosa County, Florida	2005	Phillips, John C. and Cindy Sommerkamp	TA-5
Blackwater River State Forest, Brooks Pit Expansion, Okaloosa County	2006	Cathey, Tom	TA-7

Survey Reports in Blackwater State Forest			
Title	Publication Date	Author	TA
Phase I Cultural Resources Survey of the Proposed 2006 DEP 319 Grant Project in the Blackwater River State Forest Santa Rosa County, Florida	2005	Phillips, John C. and Cindy Sommerkamp	TA-5
Sherman Kennedy Road Improvements at Panther Creek, Blackwater River State Forest	2007	White, Murray	TA-3
Training Center Rd./N. end re-alignment, Blackwater River State Forest, Santa Rosa County	2007	White, Murray	TA-6
New Blackwater Forestry Center septic field line installation, Blackwater River State Forest, Santa Rosa County	2007	Hill, Randy	TA-6
Blackwater River State Park, Campground Renovation , Santa Rosa County	2009	Shaw, Marshall	TA-8
Florida Gas Transmission Phase VIII First Addendum Report Related to Report Nos. 2008-07035 and 2008-07036	2009	Barse, William, Sean Coughlin and Emily Crowe	TA-4
Archaeological Monitoring Results/Letter of Transmission Blackwater River State Forest Munson Borrow Pit	2009	Langston, Liz	TA-2
Florida Gas Transmission Phase VIII Second Addendum Report Related to Report Nos. 2008-07035 and 2008-07036 (Goodwin & Coughlin et al. 2010)	2010	Coughlin, Sean, Emily Crowe and Christopher Goodwin	TA-4
Cultural Resource Investigations Conducted along Loops 3, 5, 10, and Greenfield 1 associated with the planned Florida Gas Transmission Company (FGT) Phase VIII Expansion project. Fourth Addendum Report Related to Report Nos. 2008-07035 and 2008-07036	2010	Coughlin, Sean, Emily Crowe and Christopher Goodwin	TA-4
Phase I Cultural Resources Survey and Archaeological Inventory of Loops 2, 3, 4, 5, 6, and Greenfield 1 of the Florida Gas Transmission Company, LLC Phase VIII Expansion Project, Escambia, Santa Rosa, Okaloosa, Walton,	2008	R. Christopher Goodwin & Associates	TA-4

Survey Reports in Blackwater State Forest			
Title	Publication Date	Author	TA
Washington, Bay, Calhoun, Jackson,			
Cultural Resource Assessment Survey Off-Highway Vehicle Trail Facilities Blackwater State Forest Santa Rosa County, Florida	2010	Archaeological Consultants, Inc.	TA-5
Cultural Resource Assessment of a Segment of State Road 189, From State Road 4, in Baker, North Alabama State Line.	1994	Penton, Daniel T.	TA-4
Cultural Resource Assessment of a Portion of State Road 4, From the Santa Rosa County Line to State Road 189 in Baker.	1995	Penton, Daniel T.	TA-3
Treatment of Cultural Resources during a 3D Seismic Survey, by Fairways Exploration and Production, within Blackwater River State Forest, Florida	2011	Miller, James J. and Ross Morrell	TA-1
Cultural Resource Survey for the Retrieval and Removal of Pre-Cut Submerged Timber in the Blackwater River, Santa Rosa and Okaloosa Counties, Application Number: 46-0311545-001-E1	2012	Cockrell, Wilburn A	TA-7

F.2 ARCHAEOLOGICAL SITES IN BLACKWATER STATE FOREST

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
Training Area 1					
TA-1	SR00797	NN	Homestead, Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR00815	NN	Artifact scatter-Deptford, 700 B.C.-300 B.C.	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR00816	NN	Middle Archaic Artifact scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR00817	NN	Middle Archaic Single artifact or isolated find	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR00818	NN	Prehistoric isolated find	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR00865	LM90-12	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00866	LM90-13	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-1	SR00868	LM90-15	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00869	LM90-16	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00870	LM90-17	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00871	LM90-18	Agriculture/Farm structure, Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00872	LM90-19	Prehistoric Variable density scatter of artifacts	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR00876	LM90-23	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00885	LM90-32	Prehistoric	Ineligible for NRHP, Not Evaluated by	Penton, Daniel T., 1991. Phase III Archaeological

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
				SHPO	Survey of the Blackwater River Drainage
TA-1	SR00886	LM90-33	Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00887	LM90-34	Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00888	LM90-35		Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00889	LM90-36	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00890	LM90-37	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR00903	LM90-50	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
					Drainage
TA-1	SR00906	LM90-53	Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-1	SR01021	MCLELLAN TRANSECT 3	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-1	SR01178	MCLELLAN TRANSECT 2	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-1	SR01196	LM91-3	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-1	SR01197	LM92-2	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-1	SR01198	LM92-3	Prehistoric Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR01199	GUM LANDING HAMMOCK 1	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System:

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
					An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-1	SR01200	GUM LANDING HAMMOCK 2	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-1	SR01201	GUM LANDING HAMMOCK 3	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-1	SR01217	NN	Prehistoric Artifact Scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-1	SR01221	NN	Prehistoric Artifact Scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR01222	NN	Prehistoric Artifact Scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR01226	BIG JUNIPER MILL	Grist mill, Twentieth century American, 1900-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR01240	DIXON WASTEWAY	Nineteenth century American, 1821-1899	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR01243	COLDWATER CREEK DAM	Grist mill, American, 1821-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-1	SR01382	Dixon Creek Log Ditch	Nineteenth century American, 1821-1899/Twentieth century American, 1900-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 2					
TA-2	SR00242	NN	Agriculture/Farm structure	Not Evaluated by Recorder	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-2	SR00246	NN	Early Archaic Lithic scatter/quarry (prehistoric: no ceramics)	Not Evaluated by Recorder	Mikell, Gregory A., 1988. An Archaeological Survey of the Teledyne Exploration Company Seismic Testing Lines DNR No. G-100-88, Blackwater State Forest, Santa Rosa and Okaloosa Counties. [Confidential per F. S. 377.2409; in BHP/CR]
TA-2	SR00247	NN	Artifact scatter-Woodland	Not Evaluated by Recorder	Mikell, Gregory A., 1988. An Archaeological Survey of the Teledyne Exploration Company Seismic Testing Lines DNR No. G-100-88, Blackwater State Forest, Santa Rosa and Okaloosa Counties. [Confidential per F. S. 377.2409; in BHP/CR]
TA-2	SR00761	SWEETWATER CREEK 1	Lithic scatter/quarry (prehistoric: no ceramics)	Not Evaluated by Recorder	DHR Records, no reference provided
TA-2	SR00789	NN	Artifact scatter-Archaic, 8500 B.C.-1000 B.C.	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-2	SR00810	NN	Prehistoric lithics only, but not quarry	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-2	SR00811	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-2	SR00839	SWEETWATER CREEK MILL	Mill of unspecified function, Nineteenth century American, 1821-1899	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-2	SR00849	LONG BRANCH GV	Prehistoric Artifact Scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-2	SR00878	LM90-25	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00879	LM90-26	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00880	LM90-27		Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-2	SR00881	LM90-28		Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00882	LM90-29	Prehistoric Artifact scatter-with pottery	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00883	LM90-30		Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00884	LM90-31	Farmstead, Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00892	LM90-39	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00893	LM90-40	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-2	SR00894	LM90-41	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00895	LM90-42	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00896	LM90-43	Prehistoric isolated find	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00910	LM90-57	Prehistoric isolated find	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00919	LM90-73	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR00922	LM90-76	Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-2	SR00923	LM90-77	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-2	SR01215	NN	Prehistoric Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-2	SR01227	REEDY CREEK DAM	Mill of unspecified function; American, 1821-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-2	SR01231	COTTON'S CHOP MILL	Mill of unspecified function; American, 1821-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 3					
TA-3	OK00110	KENNEDY BRIDGE	Campsite (prehistoric) with pottery	Not Evaluated by Recorder	DHR Records, no reference provided
TA-3	OK00113	BURNHILL PLANTATION MILL	Mill of unspecified function, American, 1821-present	Not Evaluated by Recorder	DHR Records, no reference provided
TA-3	OK00120	NORTH PANTHER CREEK	Weeden Island, A.D. 450-1000	Not Evaluated by Recorder	DHR Records, no reference provided
TA-3	OK00121	MIDDLE PANTHER CREEK	Weeden Island, A.D. 450-1000	Not Evaluated by Recorder	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-3	OK00122	MARE CREEK	Lithic scatter/quarry (prehistoric: no ceramics)	Not Evaluated by Recorder	DHR Records, no reference provided
TA-3	OK00123	LOWER PANTHER CREEK	Artifact scatter-Weeden Island, A.D. 450-1000	Not Evaluated by Recorder	DHR Records, no reference provided
TA-3	OK00507	NN	Prehistoric Artifact Scatter	Not Evaluated by Recorder	White, Murray, 2007. Sherman Kennedy Road Improvements at Panther Creek, Blackwater River State Forest
TA-3	OK00508	NN	Prehistoric lithics only, but not quarry	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00509	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00511	NN	Prehistoric lithics only, but not quarry	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00512	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00513	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00515	NN	Prehistoric lithics only, but not quarry	Ineligible for NRHP, Not	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
				Evaluated by SHPO	
TA-3	OK00526	LM90-58	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-3	OK00527	LM90-59	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-3	OK00528	LM90-60	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-3	OK00529	LM90-61	Single artifact or isolated find, Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-3	OK00530	LM90-62	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-3	OK00541	LM 92-4	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-3	OK00542	LM 92-516	Variable density scatter of artifacts; Early Archaic	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00543	LM 92-7	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00544	LM 92-8	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00545	LM 92-9/11	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00546	LM 92-10/12	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00547	LM 92-13	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00548	LM 92-14	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-3	OK00550	LM 92-17	Variable density scatter of artifacts; Late Archaic/ Early Archaic	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00551	LM 92-18	Variable density scatter of artifacts; Early Archaic	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00552	LM 92-19	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00553	LM 92-20	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00554	LM 92-21	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00559	LM 92-26	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00610	LM 92-46	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-3	OK00613	LEFT FIELD HAMMOCK	Variable density scatter of artifacts; Weeden Island, A.D. 450-1000	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00615	LM 92-51	Variable density scatter of artifacts	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00616	LM 92-52	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00617	LM 92-53	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00618	LM 92-54/55	Variable density scatter of artifacts	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00619	LM 92-56	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00620	LM 92-58	Variable density scatter of artifacts	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-3	OK00621	LM 92-59	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00622	LM 92-60	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00624	LM 92-61	Variable density scatter of artifacts	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00625	LM 92-62	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00626	LM 92-63	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00627	LM 92-64	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-3	OK00628	LM 92-65		Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-3	OK00634	92-71	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 4					
TA-4	OK00118	WEST HORSE CREEK	Historic refuse / Dump, American, 1821-present	Not Evaluated by Recorder	DHR Records, no reference provided
TA-4	OK00119	EAST HORSE CREEK	Artifact scatter-Swift Creek, 300 B.C.-A.D.450/Weeden Island, A.D. 450-1000	Not Evaluated by Recorder	DHR Records, no reference provided
TA-4	OK00566	LM 92-33	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00567	LM 92-34	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00569	LM 92-36	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00570	LM 92-37	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-4	OK00571	LM 92-38	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00572	LM 92-39	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00573	LM 92-40	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00574	LM 92-41	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00575	LM 92-42	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00576	LM 92-43	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00577	LM 92-44	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-4	OK00611	LM 92-47	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00629	LM 92-66	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00630	LM 92-67	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00633	LM 92-70	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-4	OK00684	KARICK LAKE	Mill of unspecified function, Twentieth century American, 1900-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 5					
TA-5	SR00250	NN	Historic refuse / Dump, Twentieth century American, 1900-present	Not Evaluated by Recorder	Mikell, Gregory A., 1988. An Archaeological Survey of the Teledyne Exploration Company Seismic Testing Lines DNR No. G-100-88, Blackwater State Forest, Santa Rosa

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
					and Okaloosa Counties. [Confidential per F. S. 377.2409; in BHP/CR]
TA-5	SR00813	NN	Prehistoric Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 6					
TA-6	SR00762	SWEETWATER CREEK 2	Paleoindian, 10,000 B.C.-8500 B.C., Single artifact or isolated find	Not Evaluated by Recorder	DHR Records, no reference provided
TA-6	SR00801	NN	Homestead, Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00809	NN	Historic Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00813	NN	Prehistoric Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00823	NN	Prehistoric Artifact Scatter, with pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00824	NN	Prehistoric lithics only, but not quarry	Insufficient Information, Not	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
				Evaluated by SHPO	
TA-6	SR00825	NN	Prehistoric lithics only, but not quarry	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00826	NN	Single artifact or isolated find, Indeterminate	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00832	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00833	NN	Prehistoric Single artifact or isolated find	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00834	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00838	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR00877	LM90-24	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-6	SR00897	LM90-44	Prehistoric	Ineligible for NRHP, Not	Penton, Daniel T., 1991. Phase III

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
				Evaluated by SHPO	Archaeological Survey of the Blackwater River Drainage
TA-6	SR00911	LM90-63	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-6	SR00912	LM90-64	Prehistoric isolated find	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-6	SR00913	LM90-65	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-6	SR00915	LM90-67	Twentieth century American, 1900-present	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-6	SR00918	LM90-72	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-6	SR01018	SPRINGHILL TRANSECT 3	Early Archaic Artifact scatter	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-6	SR01019	SPRINGHILL TRANSECT	Weeden Island, A.D. 450-1000 Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-6	SR01307	SITCO #18	Prehistoric lacking pottery	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-6	SR01308	SITCO #19	Prehistoric lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 7					

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-7	OK00479	BOUNDARY LINE	Artifact scatter-Weeden Island, A.D. 450-1000	Not Evaluated by Recorder	Mikell, Gregory A., 1988. An Archaeological Survey of the Teledyne Exploration Company Seismic Testing Lines DNR No. G-100-88, Blackwater State Forest, Santa Rosa and Okaloosa Counties. [Confidential per F. S. 377.2409; in BHP/CR]
TA-7	OK00531	LM90-68	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-7	OK00532	LM90-69	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-7	OK00614	LM 92-50	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	OK00908	SITCO #23	Single artifact or isolated find, Prehistoric lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-7	OK00909	SITCO #24	Single artifact or isolated find, Prehistoric lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	OK00910	SITCO #25	Prehistoric Artifact scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	OK00911	SITCO #26	Prehistoric Single artifact or isolated find	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	OK00924	SITCO #33	Prehistoric Artifact Scatter lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	OK00925	SITCO #34	Prehistoric Artifact Scatter lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	OK00926	SITCO #35	Prehistoric Single artifact or isolated find	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR00828	SITCO SURVEY 2	Campsite (prehistoric), lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR00834	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR00835	NN	Late Woodland/Middle Woodland Artifact scatter	Insufficient Information, Not	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
				Evaluated by SHPO	
TA-7	SR00836	NN	Prehistoric Artifact Scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR00837	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR00916	LM90-70	Swift Creek, Early	Not Evaluated by Recorder	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-7	SR01233	ATES CREEK MILL	Grist mill, Nineteenth century American, 1821-1899	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR01298	SITCO #11	Nineteenth century American, 1821-1899	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-7	SR01339	DARRYL	Prehistoric	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
Training Area 8					
TA-8	OK00514	NN	Artifact scatter- Prehistoric with pottery	Insufficient Information,	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
				Not Evaluated by SHPO	
TA-8	SR01915	SHOP	Building remains/Historic refuse / Dump, Twentieth century American, 1900-present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR00803	NN	Homestead, Nineteenth century American, 1821-1899	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR00808	NN	Late Woodland artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR00809	NN	Historic Artifact scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR00812	NN	Nineteenth century American, 1821-1899/Prehistoric with pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR00822	NN	Prehistoric Artifact Scatter	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR00829	NN	Prehistoric Artifact Scatter	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-8	SR00927	BW3-D	Prehistoric	Ineligible for NRHP, Not Evaluated by SHPO	Penton, Daniel T., 1991. Phase III Archaeological Survey of the Blackwater River Drainage
TA-8	SR01175	FLORIDALE TRANSECT 1	Artifact scatter	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-8	SR01176	FLORIDALE TRANSECT 2A	Single artifact or isolated find	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-8	SR01177	FLORIDALE TRANSECT 2B	Artifact scatter-low density (< 2 per sq meter)	Insufficient Information, Not Evaluated by SHPO	McKenzie, C. Lee and John Phillips, 1992. Archaeology and the Geographic Resource Analysis

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
					Support System: An Evaluation of a Soil Conservation Service Model of Archaeological Site Locations in Santa Rosa County, Florida
TA-8	SR01237	COON CAMP MILL	Grist mill, Twentieth century American, 1900- present	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR01300	J5SR002	Prehistoric lacking pottery	Ineligible for NRHP, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR01301	SITCO #12	Historic earthworks, Nineteenth century American, 1821-1899	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR01306	SITCO #17	Prehistoric lacking pottery	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR01338	WOLFTRAP BRANCH	Prehistoric	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-8	SR01368	NN	Early Archaic	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
Training Area 9					
TA-9	OK01659	GUEST LAKE LANDING	Campsite (prehistoric)/ Ceramics	Ineligible for NRHP, Not Evaluated by SHPO	Mikell, Gregory A., 2000. A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa Counties, Florida
TA-9	OK01660	FLORIDALE # 2	Campsite (prehistoric)/ Ceramics	Ineligible for NRHP, Not Evaluated by SHPO	Mikell, Gregory A., 2000. A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa Counties, Florida
TA-9	OK01661	FLORIDALE # 3	Campsite (prehistoric)/ Ceramics	Ineligible for NRHP, Not Evaluated by SHPO	Mikell, Gregory A., 2000. A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa Counties, Florida

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
TA-9	SR01399	Julian Mill	American Acquisition/Territorial Developmt 1821-45	Insufficient Information, Not Evaluated by SHPO	DHR Records, no reference provided
TA-9	SR01501	Miller Bluff West	Weeden Island, A.D. 450-1000	Insufficient Information, Not Evaluated by SHPO	Mikell, Gregory A., 2000. A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa Counties, Florida
TA-9	SR01502	Harold SE #2&3	Prehistoric with pottery	Insufficient Information, Not Evaluated by SHPO	Mikell, Gregory A., 2000. A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa Counties, Florida
TA-9	SR01503	West Pitts River Boat Ramp	Campsite (prehistoric)/ Twentieth century American, 1900-present	Insufficient Information, Not Evaluated by SHPO	Mikell, Gregory A., 2000. A Cultural Resources Survey of the Lower Yellow River, Northwest Florida Water Management District Land in Okaloosa and Santa Rosa

Archaeological Sites in Blackwater State Forest					
TA	Site #	Site Name	Site Description	NRHP Evaluation	Reference
					Counties, Florida

F.3 SURVEY REPORTS IN TATE'S HELL

Survey Reports in Tate's Hell			
Report Title	Publication Date	Authors	Training Area
Archaeological and Historical Survey of Florida Power Corporation 250 KV Transmission Lines River Crossings	1976	Scarry, John F. and Robert Williams	6
Cultural resource assessment survey of the Bob Holt Realty property near East Point, Florida.	1987	Horvath, Elizabeth A.	7
Cultural resources assessment survey of proposed borrow pit of 110 acres located in T8S, R5W, Sections 7 and 8 in Franklin County, Florida.	1989	Browing, William D. and Melissa G. Wiedenfeld	7
Archaeological Survey of the Proposed Langwood Industries Project Area Liberty County, Florida	1994	Weill, Lorna A. and Nancy White	6
Cultural Resource Survey of the Proposed Southern Pine Plantation, GEA Job No. 96-015, Franklin County, Florida	1996	Weill, Lorna A. and Nancy White	8
Archaeological Investigations of the 1994 Record Flood Impacts in the Apalachicola Valley, Northwest Florida	1996	White, Nancy Marie	7
An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida	1998	Lammers, Jonathan, Melissa Memory and Christine Newman	1, 5, 6, 7, 8, 9
An Inventory and Assessment of Historical Resources within the Apalachicola River Wildlife and Environmental Area, Franklin and Gulf Counties,	1998	Lammers, Jonathan, Melissa Memory and Christine Newman	1, 7

Survey Reports in Tate's Hell			
Report Title	Publication Date	Authors	Training Area
Florida			
Apalachicola Valley Remote Areas Archaeological Survey, Northwest Florida (V. I The Survey and Sites Located)(V. II 8GU14; 8GU94)	1999	White, Nancy Marie	1,3,5,7
Phase I Archaeological Investigations Former Camp Gordon Johnston Franklin County, Florida	2000	Hathaway, Susan, Sheila Kohring and J. Sanderson Stevens	2, 6, 8
A Cultural Resource Assessment of the Tiner Telecommunications Tower in East Point, Franklin County, Florida	2003	Earnest, Tray G.	7
Cellular Tower: Carrabelle 17096-003-024, 1684 Ken Cope Road, Carrabelle, Franklin County, Florida	2002	Pracht, Jodi B.	2,9
A Cultural Resources Assessment of the Lanark Tower Site, Franklin County, Florida	2002	Keel, Frank	2
Cingular Cellular Tower, US 98 & 319, Franklin County, Florida	2004	Wayne, Lucy B.	2
A Cultural Resource Reconnaissance of the Bobby Cresap Property in Franklin County, Florida	2005	Earnest, Tray G.	5
A Cultural Resource Reconnaissance of the Sanaullah Property in Franklin County, Florida	2005	Earnest, Tray G and Lindsay Parker	5
A Cultural Resource Reconnaissance of the Rovner Property in Franklin County, Florida	2005	Earnest, Tray G and Lindsay Parker	7
A Cultural Resource Reconnaissance of the Proposed Twin Lakes Residential Development, Franklin County, Florida	2005	Earnest, Samantha	5
A Reconnaissance-Level Cultural Resources Assessment of the Jordan Bayou Preserve Project, Franklin County, Florida	2006	Hines, Barbara	7
Cultural Resource Reconnaissance Survey Schneider Tract, Franklin County, Florida	2007	Archaeological Consultants, Inc.	7

Survey Reports in Tate's Hell			
Report Title	Publication Date	Authors	Training Area
A Cultural Resource Assessment of the Whiskey George Property in Franklin County, Florida	2008	Earnest, Tray G.	1, 5, 7
Tates Hell State Forest, 5th Deep Well Site on THSF by NFWFMD, Franklin County	2008	Morse, David	8
Carrabelle Historic Preservation Survey and Plan (Grant S0909)	2009	Brinkley, Wm. Gerald L., Beth LaCivita and Joel McEachin	5,7,9
A Phase I Cultural Resources Assessment of Progress Energy's Tree Maintenance within the Apalachicola National Forest Existing Easement, Crawfordville Substation to the Apalachicola River, Franklin, Liberty, and Wakulla Counties, Florida	2010	Cremer, David E. and Barbara Hines	4,6
Archaeological and Historical Resource Assessment of State Project No. 49010-1543, Work Program Item No. 3112665, Franklin County, Florida	1987	Browning, William D.	7
Cultural Resource Reconnaissance Assessment of the Carrabelle-East Point Transmission Line Rebuild, Franklin County, Florida	2012	Carlson, Lisabeth	5,7

F.4 ARCHAEOLOGICAL SITES IN TATE'S HELL

Archaeological Sites in Tate's Hell					
Tract #	Site Number	Site Name	Site Description	NRHP Evaluation	Reference
Training Area 1					
1	FR00827	USFS 90-3 APA/Buzzing Wires	Prehistoric Artifact scatter	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
Training Area 2					
2 and 5	FR00865	Oxbow Bluff	Prehistoric lithics	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
2 and 5	FR00866	Oyster Camp	Prehistoric Campsite; Twentieth century American, 1900-present	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
2	FR00920	Gator Creek Bridge	Bridge Remains; American, 1821-present	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
2 and 6	FR00931	Gully Branch	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
2	FR00935	Morgan Still	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
Training Area 3					
3	FR00872	Cinder Palace	Ceramic scatter; Deptford, 700 B.C.-300 B.C.; Weeden Island I	Insufficient Information, Not evaluated by SHPO	DHR Records, no reference provided
3	FR00927	Lewis Bluff Bridge Remains	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided

Archaeological Sites in Tate's Hell					
Tract #	Site Number	Site Name	Site Description	NRHP Evaluation	Reference
3	FR00932	Rock Landing	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
Training Area 5					
2 and 5	FR00865	Oxbow Bluff	Prehistoric lithics	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
2 and 5	FR00866	Oyster Camp	Prehistoric Campsite; Twentieth century American, 1900-present	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
5	FR00887	Burnt Bridge Dipping Vat	Other	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
5	FR00924	Pope Place	Historic well	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
5	FR00925	Parker Place	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
5	FR00934	Dew Drop Inn	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
Training Area 6					
6	FR00879	Harberson City Bridge	Bridge Remains; Twentieth century American, 1900-present	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
6	FR00933	Squirrel Road Dipping Vat	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided

Archaeological Sites in Tate's Hell					
Tract #	Site Number	Site Name	Site Description	NRHP Evaluation	Reference
2 and 6	FR00931	Gully Branch	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
Training Area 8					
8	FR00751	Pitcher Plant	Lithic scatter/quarry (prehistoric: no ceramics)	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
8	FR00753	Whiskey George Creek	Prehistoric Campsite with pottery	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
8	FR00886	North Beverly	Historic town; Twentieth century American, 1900-present	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
8	FR00923	Buck Siding	Twentieth century American, 1900-present	Not Evaluated by Recorder or SHPO	Carlson, 2012. Cultural Resource Reconnaissance Assessment of the Carrabelle-East Point Transmission Line Rebuild, Franklin County, Florida
8	FR00926	Deep Creek Still	Twentieth century American, 1900-present	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
Training Area 10					
10	FR00007	Topsail Bluff	Prehistoric shell midden; Deptford, 700 B.C.-300 B.C.; Swift Creek, 300 B.C.-A.D.450; Island, A.D. 450-1000; Ft. Walton, A.D. 1000-1500	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida

Archaeological Sites in Tate's Hell					
Tract #	Site Number	Site Name	Site Description	NRHP Evaluation	Reference
10	FR00785	Dot's Landing	Prehistoric midden(s); Early Archaic Kirk; Deptford, 700 B.C.-300 B.C.; Weeden Island, A.D. 450-1000	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
10	FR00862	High Bluff Homestead	Historic well; Twentieth century American, 1900-present	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
10	FR00869	Turtle Kill	Prehistoric Artifact Scatter with pottery	Ineligible for NRHP, not evaluated by SHPO	Carlson, 2012. Cultural Resource Reconnaissance Assessment of the Carrabelle-East Point Transmission Line Rebuild, Franklin County, Florida
10	FR00870	John Allen Ridge	Ceramic scatter, Prehistoric shell scatter; Weeden Island, A.D. 450-1000	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
10	FR00871	Powerline Ridge	Prehistoric Artifact scatter	Ineligible for NRHP, not evaluated by SHPO	Carlson, 2012. Cultural Resource Reconnaissance Assessment of the Carrabelle-East Point Transmission Line Rebuild, Franklin County, Florida
10	FR00874	Apiary Point	Prehistoric Lithic scatter	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
10	FR00875	Laura's Cattle Dip	Twentieth century American, 1900-present	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
10	FR00880	Airstrip	Prehistoric lithics	Preservation Not Recommended, not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell

Archaeological Sites in Tate's Hell					
Tract #	Site Number	Site Name	Site Description	NRHP Evaluation	Reference
					State Forest, Franklin and Liberty Counties, Florida
10	FR00885	Pile of Cups	Turpentine camp; Deptford, 700 B.C.-300 B.C.; Twentieth century American, 1900-present	Insufficient Information, Not evaluated by SHPO	Lammers, Memory and Newman, 1998. An Inventory and Assessment of Cultural Resources Within Tate's Hell State Forest, Franklin and Liberty Counties, Florida
10	FR00921	Sparky's Grave	Human Remains	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided
10	FR00930	Old School	Historic	Not Evaluated by Recorder or SHPO	DHR Records, no reference provided

APPENDIX G

NEPA DISCLOSURE STATEMENT

**G.NEPA DISCLOSURE STATEMENT FOR THE GULF REGIONAL
AIRSPACE STRATEGIC INITIATIVE (GRASI) LANDSCAPE
INITIATIVE ENVIRONMENTAL IMPACT STATEMENT (W91278-12-D-
0030-0005)**

The Council on Environmental Quality (CEQ) Regulations at Title 40 of the *Code of Federal Regulations* (CFR) Section 1506.5(c), which have been adopted by the U.S. Air Force (32 CFR 989), require contractors and subcontractors who will prepare an environmental impact statement to execute a disclosure specifying that they have no financial or other interest in the outcome of the project.

"Financial or other interest in the outcome of the project" is defined as any direct financial benefit such as a promise of future construction or design work in the project, as well as indirect financial benefits the contractor is aware of.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows, to the best of their actual knowledge as of the date set forth below:

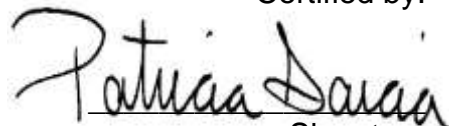
(a) X Offeror and any proposed subcontractors have no financial or other interest in the outcome of the project.

(b) Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract, or agree to the attached plan to mitigate, neutralize or avoid any such conflict of interest.

Financial or Other Interests:

None

Certified by:



Signature

PATRICIA L. GARCIA

Name

SR.CONTRACTS REPRESENTATIVE

Title

LEIDOS

Company

22 January 2014

Date

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APPENDIX H

NOISE

TABLE OF CONTENTS

	<u>Page</u>
H.1 NOISE DESCRIPTORS AND IMPACT	H-1
H.1.1 Quantifying Sound	H-1
H.1.2 Noise Metrics	H-4
H.1.2.1 Maximum Sound Level	H-4
H.1.2.2 Sound Exposure Level	H-5
H.1.2.3 Equivalent Sound Level	H-5
H.1.2.4 Day–Night Average Sound Level	H-5
H.1.2.5 Onset-Adjusted Monthly Day–Night Average Sound Level	H-6
H.1.2.6 Peak Noise Level	H-6
H.1.3 Noise Impact	H-7
H.1.3.1 Community Reaction	H-7
H.1.3.2 Land Use Compatibility	H-9
H.2 NOISE EFFECTS	H-13
H.2.1 Annoyance	H-13
H.2.2 Speech Interference	H-14
H.2.3 Sleep Disturbance	H-15
H.2.4 Noise-Induced Hearing Impairment	H-19
H.2.4.1 Hearing Loss and Aircraft Noise	H-20
H.2.5 Nonauditory Health Effects	H-22
H.2.6 Performance Effects	H-24
H.2.7 Noise Effects on Children	H-24
H.2.7.1 Effects on Learning and Cognitive Abilities	H-24
H.2.7.2 Health Effects	H-26
H.2.8 Noise Effects on Domestic Animals and Wildlife	H-27
H.2.8.1 Domestic Animals	H-28
H.2.8.2 Wildlife	H-31
H.2.8.3 Mammals	H-31
H.2.8.4 Birds	H-34
H.2.8.5 Raptors	H-35
H.2.8.6 Migratory Waterfowl	H-37
H.2.8.7 Wading and Shore Birds	H-38
H.2.8.8 Fish, Reptiles, and Amphibians	H-39
H.2.8.9 Summary	H-39
H.2.9 Property Values	H-40
H.2.10 Subsonic Aircraft Noise Effects on Structures	H-41
H.2.11 Subsonic Aircraft Noise Effects on Structure and Terrain	H-41
H.2.12 Noise Effects on Historical and Archaeological Sites	H-41
H.3 NOISE MODELING METHODOLOGY USED IN GLI EIS	H-43
H.3.1 Aircraft Noise Modeling Methods	H-43
H.3.1.1 Noise Modeling Method for Landing Zones (LZs) and Drop Zones (DZs)	H-43
H.3.1.2 Noise Modeling Method for Blackwater Airfield	H-46
H.3.1.3 Noise Modeling Method for Overwater Hoist Operations	H-47
H.3.1.4 Noise Modeling Method for Distributed Flying Operations	H-47
H.3.1.5 Operations Frequency	H-48
H.3.2 Munitions Noise Modeling Methods	H-49
H.4 REFERENCES	H-50

List of Figures

	<u>Page</u>
Figure H-1. Typical A-Weighted Sound Levels of Common Sounds.....	H-4
Figure H-2. Community Surveys of Noise Annoyance	H-7
Figure H-3. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold et al. 1994) Curve Fits.....	H-8
Figure H-4. Plot of Sleep Awakening Data versus Indoor SEL.....	H-16
Figure H-5. FICAN's 1997 Recommended Sleep Disturbance Dose-Response Relationship.....	H-17
Figure H-6. Relation Between Indoor SEL and Percentage of Persons Awakened as Stated in ANSI/ASA S12.9-2008/Part 6	H-18
Figure H-7. CV-22 Approach to LZ/DZ and Departure from LZ/DZ Flight Profiles	H-44
Figure H-8. C-23 Approach to Airstrip and Departure from Airstrip Flight Profiles	H-47

List of Tables

	<u>Page</u>
Table H-1. Relation Between Annoyance, DNL and CDNL.....	H-9
Table H-2. Land Use Compatibility, Noise Exposure, and Accident Potential.....	H-10
Table H-3. Average NIPTS and 10th Percentile NIPTS as a Function of DNL	H-20
Table H-4. CV-22 Weighted Average Number of Aircraft Per Sortie.....	H-44
Table H-5. Aircraft Proposed for Use in Fixed-Wing A/LVL.....	H-46
Table H-6. Potential Surrogates in NOISEMAP.....	H-46
Table H-7. Frequency of Operations at the LZ/DZs (including Blackwater Airfield)	H-48
Table H-8. Frequency of Fixed-Wing A/LVL Operations	H-48
Table H-9. Frequency of Overwater Hoist Operations (OHO)	H-49
Table H-10. Frequency of Distributed Flying Operations.....	H-49

H. NOISE

Click on [hyperlinks](#) to jump to an element, and hold down the “Alt” key while pressing the “left-arrow” key to GO BACK.



Appendix H provides a general noise primer to educate the reader on what constitutes noise, how it is measured, and the studies that were used in support of how and why noise is modeled.

Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). Noise analysis thus requires a combination of physical measurement of sound, physical and physiological effects, plus psycho- and socio-acoustic effects.

Section [H.1](#) of this appendix describes how sound is measured and summarizes noise impacts in terms of community acceptability and land use compatibility. Section [H.2](#) gives detailed descriptions of the effects of noise that lead to the impact guidelines presented in Section [H.1](#). Section [H.3](#) provides a description of the specific methods used to predict aircraft noise.

H.1 NOISE DESCRIPTORS AND IMPACT

Aircraft operating in military airspace generate two types of sound. One is “subsonic” noise, which is continuous sound generated by the aircraft’s engines and also by air flowing over the aircraft itself. The other is sonic booms (where authorized for supersonic), which are transient impulsive sounds generated during supersonic flight. These are quantified in different ways.

Section [H.1.1](#) describes the characteristics which are used to describe sound. Section [H.1.2](#) describes the specific noise metrics used for noise impact analysis. Section [H.1.3](#) describes how environmental impact and land use compatibility are judged in terms of these quantities.

H.1.1 Quantifying Sound

Measurement and perception of sound involve two basic physical characteristics: amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of the pressure of a sound wave. Because sound pressure varies in time, various types of pressure averages are usually used. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Frequency is measured in units of cycles per second, or hertz (Hz).

Amplitude. The loudest sounds the human ear can comfortably hear have acoustic energy one trillion times the acoustic energy of sounds the ear can barely detect. Because of this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is, therefore, usually represented on a logarithmic scale with a unit called the decibel (dB). Sound measured on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Because of the logarithmic nature of the decibel scale, sound levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

$$60 \text{ dB} + 60 \text{ dB} = 63 \text{ dB, and}$$

$$80 \text{ dB} + 80 \text{ dB} = 83 \text{ dB.}$$

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

$$60.0 \text{ dB} + 70.0 \text{ dB} = 70.4 \text{ dB.}$$

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as “decibel addition” or “energy addition.” The latter term arises from the fact that the combination of decibel values consists of first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The difference in dB between two sounds represents the ratio of the amplitudes of those two sounds. Because human senses tend to be proportional (i.e., detect whether one sound is twice as big as another) rather than absolute (i.e., detect whether one sound is a given number of pressure units bigger than another), the decibel scale correlates well with human response.

Under laboratory conditions, differences in sound level of 1 dB can be detected by the human ear. In the community, the smallest change in average noise level that can be detected is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound *intensity* but only a 50 percent decrease in perceived *loudness* because of the nonlinear response of the human ear (similar to most human senses).

The one exception to the exclusive use of levels, rather than physical pressure units, to quantify sound is in the case of sonic booms. Sonic booms are coherent waves with specific characteristics. There is a long-standing tradition of describing individual sonic booms by the amplitude of the shock waves, in pounds per square foot (psf). This is particularly relevant when assessing structural effects as opposed to loudness or cumulative community response. In this environmental analysis, sonic booms are quantified by either dB or psf, as appropriate for the particular impact being assessed.

Frequency. The normal human ear can hear frequencies from about 20 Hz to about 20,000 Hz. It is most sensitive to sounds in the 1,000 to 4,000 Hz range. When measuring community response to noise, it is common to adjust the frequency content of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A weighting (ANSI 1988). Sound levels that have been so adjusted are referred to as A weighted sound levels.

The audible quality of high thrust engines in modern military combat aircraft can be somewhat different than other aircraft, including (at high throttle settings) the characteristic nonlinear crackle of high thrust engines. The spectral characteristics of various noises are accounted for by A-weighting, which approximates the response of the human ear but does not necessarily account for quality. There are other, more detailed, weighting factors that have been applied to sounds. In the 1950s and 1960s, when noise from civilian jet aircraft became an issue, substantial research was performed to determine what characteristics of jet noise were a problem. The metrics Perceived Noise Level and Effective Perceived Noise Level were developed. These accounted for nonlinear behavior of hearing and the importance of low frequencies at high levels, and for many years airport/airbase noise contours were presented in terms of Noise Exposure Forecast, which was based on Perceived Noise Level and Effective Perceived Noise Level. In the 1970s, however, it was realized that the primary intrusive aspect of aircraft noise was the high noise level, a factor which is well represented by A-weighted levels and day–night average sound level (DNL). The refinement of Perceived Noise Level, Effective Perceived Noise Level, and Noise Exposure Forecast was not significant in protecting the public from noise.

There has been continuing research on noise metrics and the importance of sound quality, sponsored by the U.S. Department of Defense (DoD) for military aircraft noise and by the Federal Aviation Administration (FAA) for civil aircraft noise. The metric L_{dnmr} , which is described later and accounts for the increased annoyance of rapid onset rate of sound, is a product of this long-term research.

The amplitude of A weighted sound levels is measured in dB. It is common for some noise analysts to denote the unit of A-weighted sounds by dBA. As long as the use of A-weighting is understood, there is no difference between dB or dBA: it is only important that the use of A-weighting be made clear. In this environmental analysis, A-weighted sound levels are reported as dB.

A-weighting is appropriate for continuous sounds, which are perceived by the ear. Impulsive sounds, such as sonic booms, are perceived by more than just the ear. When experienced indoors, there can be secondary noise from rattling of the building. Vibrations may also be felt. C-weighting (ANSI 1988) is applied to such sounds. This is a frequency weighting that is relatively flat over the range of human hearing (about 20 Hz to 20,000 Hz) that rolls off above 5,000 Hz and below 50 Hz. In this study, C-weighted sound levels are used for the assessment of sonic booms and other impulsive sounds. As with A-weighting, the unit is dB, but dBC is sometimes used for clarity. In this study, sound levels are reported in both A-weighting and C-weighting dBs, and C-weighted metrics are denoted when used.

Time Averaging. Sound pressure of a continuous sound varies greatly with time, so it is customary to deal with sound levels that represent averages over time. Levels presented as instantaneous (i.e., as might be read from the display of a sound level meter) are based on averages of sound energy over either 1/8 second (fast) or 1 second (slow). The formal definitions of fast and slow levels are somewhat complex, with details that are important to the makers and users of instrumentation. They may, however, be thought of as levels corresponding to the root mean-square sound pressure measured over the 1/8-second or 1-second periods.

The most common uses of the fast or slow sound level in environmental analysis is in the discussion of the maximum sound level that occurs from the action, and in discussions of typical sound levels. [Figure H-1](#) is a chart of A-weighted sound levels from typical sounds. Some (air conditioner, vacuum cleaner) are continuous sounds whose levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle passby. Some (urban daytime, urban nighttime) are averages over some extended period. A variety of noise metrics have been developed to describe noise over different time periods. These are described in Section [H.1.2](#).

H.1.2 Noise Metrics

H.1.2.1 Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{\max} , or L_{\max} . The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleeping, or other common activities.

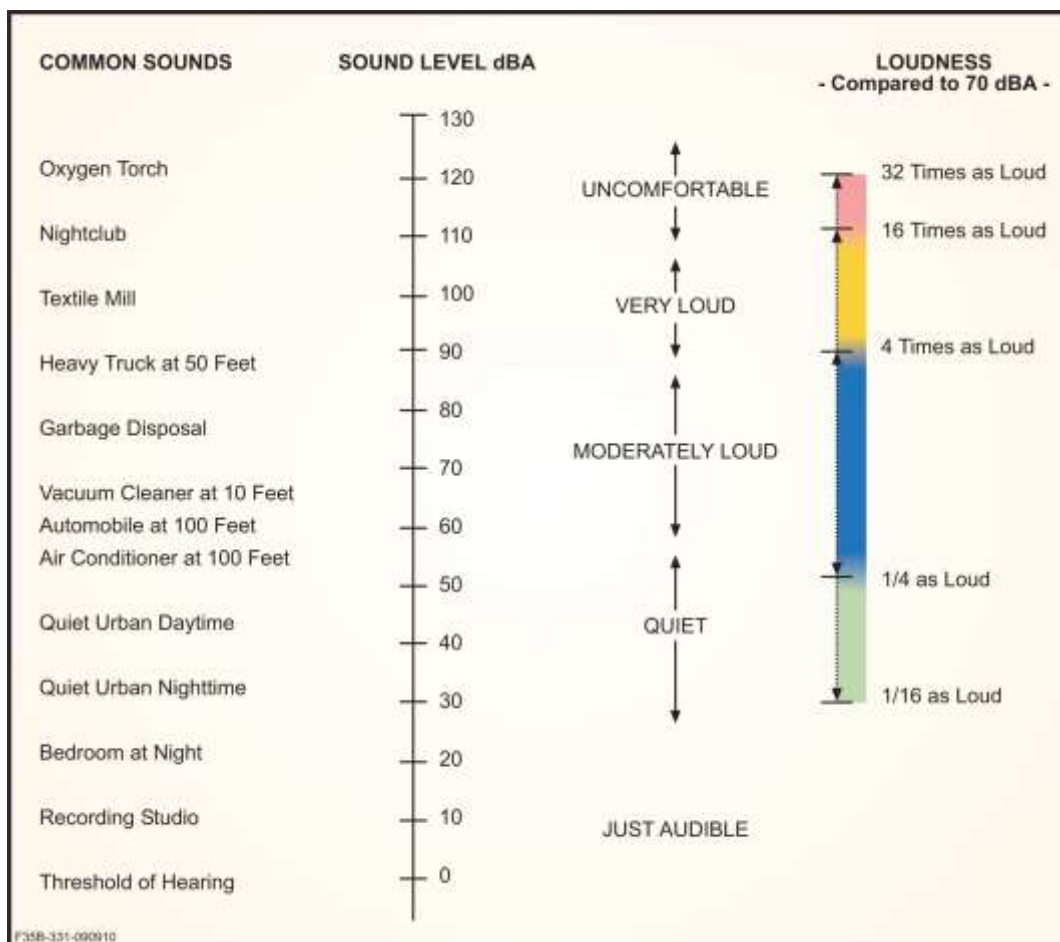


Figure H-1. Typical A-Weighted Sound Levels of Common Sounds

H.1.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. Although the maximum sound level reached during the event provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE} for A weighted sounds) combines both of these characteristics into a single metric.

SEL is a composite metric that represents both the intensity of a sound and its duration. Mathematically, the mean square sound pressure is computed over the duration of the event, then multiplied by the duration in seconds, and the resultant product is turned into a sound level. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level. Because the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

SEL can be computed for C-weighted levels (appropriate for impulsive sounds), and the results denoted CSEL or L_{CE} . SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A weighted sounds and CSEL for C-weighted.

H.1.2.3 Equivalent Sound Level

For longer periods of time, total sound is represented by the equivalent continuous sound pressure level (L_{eq}). L_{eq} is the average sound level over some time period (often an hour or a day, but any explicit time span can be specified), with the averaging being done on the same energy basis as used for SEL. SEL and L_{eq} are closely related, with L_{eq} being SEL over some time period normalized by that time.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise.

H.1.2.4 Day–Night Average Sound Level

Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10 dB penalty to events that occur after 10 pm and before 7 am. If L_{eq} is computed over a 24-hour period with this nighttime penalty applied, the result is the DNL. DNL is the community noise metric recommended by the U.S. Environmental Protection Agency (EPA) (EPA 1974) and has been adopted by most Federal agencies (FICON 1992). It has been well established that DNL correlates well with long-term community response to noise (Schultz 1978, Finegold et al. 1994). This correlation is presented in Section [H.1.3](#) of this appendix.

DNL accounts for the total, or cumulative, noise impact at a given location, and for this reason is often referred to as a “cumulative” metric. It was noted earlier that, for

impulsive sounds, such as sonic booms, C-weighting is more appropriate than A weighting. DNL computed with C-weighting is denoted CDNL or L_{Cdn} . This procedure has been standardized, and impact interpretive criteria similar to those for DNL have been developed (CHABA 1981).

H.1.2.5 Onset-Adjusted Monthly Day–Night Average Sound Level

Aircraft operations in military training airspace generate a noise environment somewhat different from other community noise environments. Overflights are sporadic, occurring at random times and varying from day to day and week to week. This situation differs from most community noise environments, in which noise tends to be continuous or patterned. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-air-speed flyover can have a rather sudden onset.

To represent these differences, the conventional DNL metric is adjusted to account for the “surprise” effect of the sudden onset of aircraft noise events on humans (Plotkin et al. 1987; Stusnick et al. 1992, 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 150 dB per second, an adjustment or penalty ranging from 0 to 11 dB is added to the normal SEL. Onset rates above 150 dB per second require an 11 dB penalty, while onset rates below 15 dB per second require no adjustment. The DNL is then determined in the same manner as for conventional aircraft noise events and is designated as onset-rate adjusted day–night average sound level (abbreviated L_{dnmr}).

Because of the irregular occurrences of aircraft operations, the number of average daily operations is determined by using the calendar month with the highest number of operations. The monthly average is denoted L_{dnmr} . Noise levels are calculated the same way for both DNL and L_{dnmr} . L_{dnmr} is interpreted by the same criteria as used for DNL.

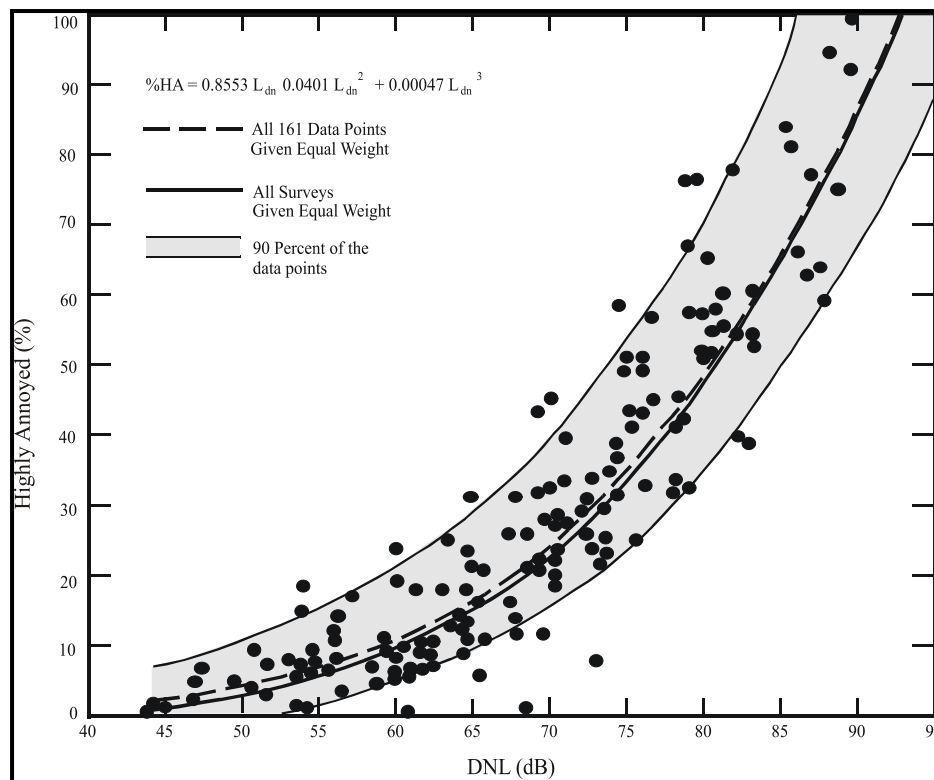
H.1.2.6 Peak Noise Level

The peak noise level metric characterizes the strength of impulsive noise such as sonic boom peak overpressure or munitions detonations. Peak noise level can be expressed in pounds per square foot (psf) or in decibel version (dB L_{pk}). The units psf are most often used when relating boom amplitude to human or animal response, although the direct physical pressure, as reflected by the unit (dB L_{pk}) is most commonly used when assessing effects on structures. Peak noise levels are strongly affected by meteorological conditions such as humidity and temperature which vary over time. To account for the variability in peak noise levels due to meteorological effects, peak noise levels are generally specified as the level not exceeded for a certain percentage of the time. As an example, noise generated by detonation of a certain munitions type may exceed 115 dB at a certain location only in the 15 percent of days with the most unfavorable meteorological conditions. The metric used to describe the peak noise level exceeding only 15 percent of the time is PK 15(met).

H.1.3 Noise Impact

H.1.3.1 Community Reaction

Studies of long-term community annoyance to numerous types of environmental noise show that DNL correlates well with the annoyance. Schultz (1978) showed a consistent relationship between DNL and annoyance. Schultz's original curve fit ([Figure H-2](#)) shows that there is a remarkable consistency in results of attitudinal surveys which relate the percentages of groups of people who express various degrees of annoyance when exposed to different DNL.



Source: Schultz 1978.

Figure H-2. Community Surveys of Noise Annoyance

Another study reaffirmed this relationship (Fidell et al. 1989). [Figure H-3](#) shows an updated form of the curve fit (Finegold et al. 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise. For example, individuals with autism are often very strongly affected by sudden noises (Tang et al. 2002). Persons with autism often report experiencing oversensitivity to noise and are often particularly sensitive to high-pitched or sudden onset noises (Grandin 1991). Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using DNL.

As noted earlier for SEL, DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure. DNL accounts for the sound level of individual noise events, the duration of those events, and the number of events. Its use is endorsed by the scientific community (ANSI 1980, 1988, 2005; EPA 1974; FICON 1992; FICUN 1980).

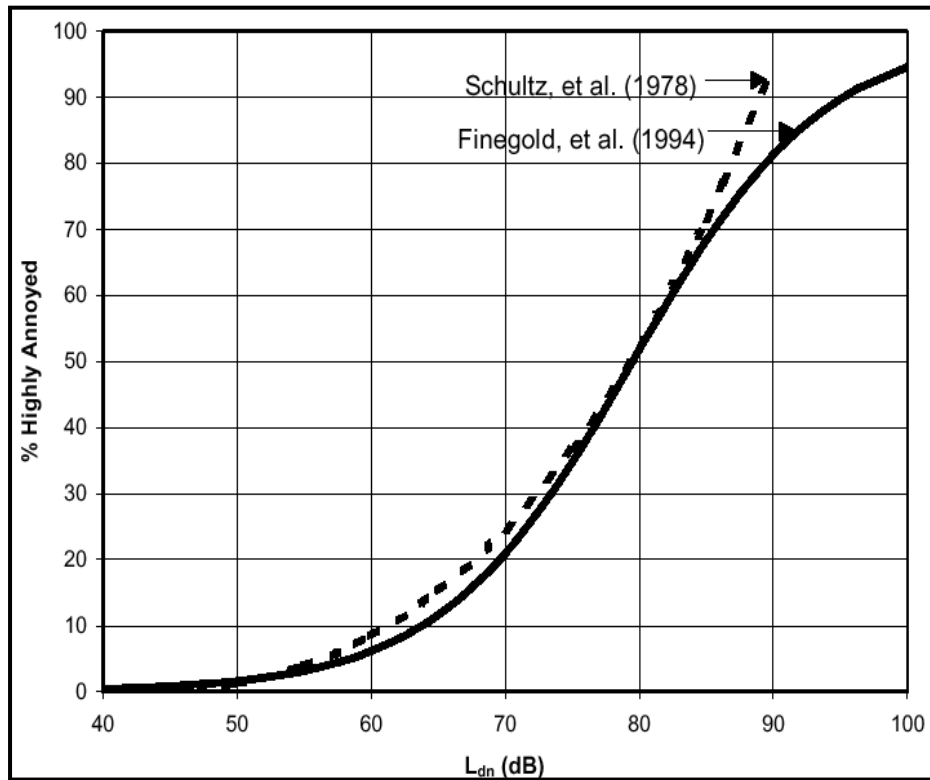


Figure H-3. Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold et al. 1994) Curve Fits

While DNL is the best metric for quantitatively assessing cumulative noise impact, it does not lend itself to intuitive interpretation by non-experts. Accordingly, it is common for environmental noise analyses to include other metrics for illustrative purposes. A general indication of the noise environment can be presented by noting the maximum sound levels which can occur and the number of times per day noise events will be loud enough to be heard. Use of other metrics as supplements to DNL has been endorsed by Federal agencies (FICON 1992).

The Schultz curve is generally applied to annual average DNL. In Section [H.1.2](#), L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. The Schultz curve is used with L_{dnmr} as the noise metric. L_{dnmr} is always equal to or greater than DNL, so impact is generally higher than would have been predicted if the onset rate and busiest-month adjustments were not accounted for.

There are several points of interest in the noise-annoyance relation. The first is DNL of 65 dB. This is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation which do cause noise. Areas exposed to DNL above 65 dB are generally not considered suitable for residential use. The second is DNL of 55 dB, which was identified by EPA

as a level “...requisite to protect the public health and welfare with an adequate margin of safety,” (EPA 1974) which is essentially a level below which adverse impact is not expected. The third is DNL of 75 dB. This is the lowest level at which adverse health effects could be credible (EPA 1974). The very high annoyance levels correlated with DNL of 75 dB make such areas unsuitable for residential land use.

Sonic boom exposure is measured by C-weighting, with the corresponding cumulative metric being CDNL. Correlation between CDNL and annoyance has been established, based on community reaction to impulsive sounds (CHABA 1981). Values of the C weighted equivalent to the Schultz curve are different than that of the Schultz curve itself. [Table H-1](#) shows the relation between annoyance, DNL, and CDNL.

Table H-1. Relation Between Annoyance, DNL and CDNL

DNL	% Highly Annoyed	CDNL
45	0.83	42
50	1.66	46
55	3.31	51
60	6.48	56
65	12.29	60
70	22.10	65

Interpretation of CDNL from impulsive noise is accomplished by using the CDNL versus annoyance values in [Table H-1](#). CDNL can be interpreted in terms of an “equivalent annoyance” DNL. For example, CDNL of 52, 61, and 69 dB are equivalent to DNL of 55, 65, and 75 dB, respectively. If both continuous and impulsive noise occurs in the same area, impacts are assessed separately for each.

H.1.3.2 Land Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the DNL or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating CDNL to an “equivalent annoyance” DNL, as outlined in Section [H.1.3.1](#).

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published guidelines (FICUN 1980) relating DNL to compatible land uses. This committee was composed of representatives from DoD, Transportation, and Housing and Urban Development; EPA; and the Veterans Administration. Since the issuance of these guidelines, Federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, DoD and FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee’s guidelines in the Federal Aviation Regulations (DOT 1984). These guidelines are reprinted in [Table H-2](#), along with the explanatory notes included in the

regulation. Although these guidelines are not mandatory (note the footnote “*” in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor DNL values above 65 dB, and the extent of land areas and populations exposed to DNL of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions. In some cases a change in noise level, rather than an absolute threshold, may be a more appropriate measure of impact.

Table H-2. Land Use Compatibility, Noise Exposure, and Accident Potential

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
10	Residential							
11	Household units							
11.11	Single units; detached	N	N	Y ¹	A ¹¹	B ¹¹	N	N
11.12	Single units; semidetached	N	N	N	A ¹¹	B ¹¹	N	N
11.13	Single units; attached row	N	N	N	A ¹¹	B ¹¹	N	N
11.21	Two units; side-by-side	N	N	N	A ¹¹	B ¹¹	N	N
11.22	Two units; one above the other	N	N	N	A ¹¹	B ¹¹	N	N
11.31	Apartments; walk up	N	N	N	A ¹¹	B ¹¹	N	N
11.32	Apartments; elevator	N	N	N	A ¹¹	B ¹¹	N	N
12	Group quarters	N	N	N	A ¹¹	B ¹¹	N	N
13	Residential hotels	N	N	N	A ¹¹	B ¹¹	N	N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A ¹¹	B ¹¹	C ¹¹	N
16	Other residential	N	N	N ¹	A ¹¹	B ¹¹	N	N
20	Manufacturing							
21	Food and kindred products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
22	Textile mill products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
24	Lumber and wood products (except furniture); manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
25	Furniture and fixtures; manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
26	Paper and allied products; manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
27	Printing, publishing, and allied industries	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
28	Chemicals and allied products; manufacturing	N	N	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
29	Petroleum refining and related industries	N	N	N	Y	Y ¹²	Y ¹³	Y ¹⁴
30	Manufacturing							
31	Rubber and misc. plastic products; manufacturing	N	N ²	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
32	Stone, clay and glass products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
33	Primary metal industries	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
34	Fabricated metal products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴

Table H-2. Land Use Compatibility, Noise Exposure, and Accident Potential, Cont'd

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks; manufacturing	N	N	N ²	Y	A	B	N
39	Miscellaneous manufacturing	N	Y ²	Y ²	Y	Y ¹²	Y ¹³	Y ¹⁴
40	Transportation, communications, and utilities							
41	Railroad, rapid rail transit, and street railroad transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
42	Motor vehicle transportation	N ³	Y	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
43	Aircraft transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
44	Marine craft transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
45	Highway and street right-of-way	N ³	Y	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
46	Automobile parking	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
47	Communications	N ³	Y ⁴	Y	Y	A ¹⁵	B ¹⁵	N
48	Utilities	N ³	Y ⁴	Y	Y	Y	Y ¹²	Y ¹³
49	Other transportation communications and utilities	N ³	Y ⁴	Y	Y	A ¹⁵	B ¹⁵	N
50	Trade							
51	Wholesale trade	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
52	Retail trade-building materials, hardware and farm equipment	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
53	Retail trade-general merchandise	N ²	N ²	Y ²	Y	A	B	N
54	Retail trade-food	N ²	N ²	Y ²	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N ²	N ²	Y ²	Y	A	B	N
56	Retail trade-apparel and accessories	N ²	N ²	Y ²	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N ²	N ²	Y ²	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N ²	Y	A	B	N
59	Other retail trade	N	N ²	Y ²	Y	A	B	N
60	Services							
61	Finance, insurance, and real estate services	N	N	Y ⁶	Y	A	B	N
62	Personal services	N	N	Y ⁶	Y	A	B	N
62.4	Cemeteries	N	Y ⁷	Y ⁷	Y	Y ¹²	Y ¹³	Y ^{14,2,1}
63	Business services	N	Y ⁸	Y ⁸	Y	A	B	N
64	Repair services	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
65	Professional services	N	N	Y ⁶	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y ⁶	Y	Y	A	B	N
67	Governmental services	N ⁶	N	Y ⁶	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N

Table H-2. Land Use Compatibility, Noise Exposure, and Accident Potential, Cont'd

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69 dB	70-74 dB	75-79 dB	80+ dB
69	Miscellaneous services	N	N ²	Y ²	Y	A	B	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	N	N	N ²	A*	B*	N	N
71.2	Nature exhibits	N	Y ²	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheatres	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y ¹⁷	Y ¹⁷	N	N
73	Amusements	N	N	Y ⁸	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N Y	Y ^{8,9,10}	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y ⁸	Y ⁸	Y*	Y*	N	N
79	Other cultural, entertainment, and recreation	N ⁹	Y ⁹	Y ⁹	Y*	Y*	N	N
80	Resources production and extraction							
81	Agriculture (except livestock)	Y ¹⁶	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20,21}
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20,21}
82	Agricultural related activities	N	Y ⁵	Y	Y ¹⁸	Y ¹⁹	N	N
83	Forestry activities and related services	N ⁵	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20,21}
84	Fishing activities and related services	N ⁵	Y ⁵	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y ⁵	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y ⁵	Y	Y	Y	Y	Y

- 1 Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.
- 2 Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any APZ.
- 3 The placing of structures, buildings, or above ground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and AFI 32-1026 for specific guidance.
- 4 No passenger terminals and no major above ground transmission lines in APZ I.
- 5 Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
- 6 Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
- 7 Excludes chapels.
- 8 Facilities must be low intensity.
- 9 Clubhouse not recommended.
- 10 Areas for gatherings of people are not recommended.
- 11a Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.

Table H-2. Land Use Compatibility, Noise Exposure, and Accident Potential, Cont'd

- 11b Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.
- 11c NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
- 12 Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
- 13 Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
- 14 Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
- 15 If noise sensitive, use indicated NLR; if not, the use is compatible.
- 16 No buildings.
- 17 Land use is compatible provided special sound reinforcement systems are installed.
- 18 Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.
- 19 Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.
- 20 Residential buildings are not permitted.
- 21 Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.

Key: SLUCM = Standard Land Use Coding Manual, U.S. Department of Transportation; Y = Yes; land use and related structures are compatible without restriction; N = No; land use and related structures are not compatible and should be prohibited; A, B, or C = Land use and related structures generally compatible; measures to achieve Noise Level Reduction of A (25 db), B (30 db), or C (35 db) should be incorporated into the design and construction of structures; A*, B*, or C* = Land use generally compatible with Noise Level Reduction. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes; * = The designation of these uses as "compatible" in this zone reflects individual Federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

H.2 NOISE EFFECTS

The discussion in Section [H.1.3](#) presented the global effect of noise on communities. The following sections describe particular noise effects. These effects include non-auditory health effects, annoyance, speech interference, sleep disturbance, noise-induced hearing impairment, noise effects on animals and wildlife, effects on property values, noise effects on structures, terrain, and cultural resources.

H.2.1 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the EPA as any negative subjective reaction on the part of an individual or group (EPA 1974). As noted in the discussion of DNL above, community annoyance is best measured by that metric.

Because the EPA Levels Document (EPA 1974) identified DNL of 55 dB as “. . . requisite to protect public health and welfare with an adequate margin of safety,” it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial resources are generally not available to achieve that goal. Most agencies have identified DNL of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (FICON 1992). This corresponds to about 12 percent of the exposed population being highly annoyed.

Although DNL of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases. Local ordinances and regulations have been adopted by many municipal governments to prevent civilian development near military installations that would be incompatible with noise generated by military operations. The decision to adopt such measures, and the specific content of the ordinances and regulations, is up to the municipal government. In many cases, the 65 DNL noise contour line is adopted as the threshold level above which land use restrictions are invoked.

H.2.2 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Speech is an acoustic signal characterized by rapid fluctuations in sound level and frequency pattern. It is essential for optimum speech intelligibility to recognize these continually shifting sound patterns. Not only does noise diminish the ability to perceive the auditory signal, but it also reduces a listener's ability to follow the pattern of signal fluctuation. In general, interference with speech communication occurs when intrusive noise exceeds about 60 dB (FICON 1992).

Indoor speech interference can be expressed as a percentage of sentence intelligibility among two people speaking in relaxed conversation approximately 3 feet apart in a typical living room or bedroom (EPA 1974). The percentage of sentence intelligibility is a non-linear function of the (steady) indoor background A-weighted sound level. Such a curve-fit yields 100 percent sentence intelligibility for background levels below 57 dB and yields less than 10 percent intelligibility for background levels above 73 dB. The function is especially sensitive to changes in sound level between 65 dB and 75 dB. As an example of the sensitivity, a 1 dB increase in background sound level from 70 dB to 71 dB yields a 14 percent decrease in sentence intelligibility. The sensitivity of speech interference to noise at 65 dB and above is consistent with the criterion of DNL 65 dB generally taken from the Schultz curve. This is consistent with the observation that speech interference is the primary cause of annoyance.

Classroom Criteria. The effect of aircraft noise on children is a controversial area. Certain studies indicate that, in certain situations, children are potentially more sensitive to noise compared to adults. For example, adults average roughly 10 percent better than young children on speech intelligibility tests in high noise environments (ASA 2000). Some studies indicate that noise negatively impacts classroom learning (e.g., Shield and Dockrell 2008).

In response to noise-specific and other environmental studies, Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (1997), requires Federal agencies to ensure that their policies, programs, and activities address environmental health and safety risks and to identify any disproportionate risks to children. While the issue of noise impacts on children's learning is not fully settled, in May 2009, the American National Standards Institute (ANSI) published a classroom acoustics standard entitled "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools" (ANSI 2002). At present, complying with the standard is voluntary in most locations. Essentially, the criteria states that when the noisiest hour is dominated by noise from such sources as aircraft, the limits for most classrooms are an hourly average A-weighted sound level of 40 dB, and the A-weighted sound level must not exceed 40 dB for more than 10 percent of the hour. For schools located near airfields, indoor noise levels would have to be lowered by 35–45 dBA relative to outdoor levels (ANSI 2009).

H.2.3 Sleep Disturbance

Sleep disturbance is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep disturbance may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons et al. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions. An extensive study of sleep interference in people's own homes (Ollerhead et al. 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with these studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the EPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (EPA 1974). Assuming an outdoor-to-indoor noise level reduction of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of SEL (Kryter 1984). [Figure H-4](#), extracted from Figure 10.37 of Kryter (1984), indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

It was noted in the early sleep disturbance research that the controlled laboratory studies did not account for many factors that are important to sleep behavior, such as habituation to the environment and previous exposure to noise and awakenings from sources other than aircraft noise. In the early 1990s, field studies were conducted to validate the earlier laboratory work. The most significant finding from these studies was that an estimated 80 to 90 percent of sleep disturbances were not related to individual outdoor noise events, but were instead the result of indoor noise sources and other non-noise-related factors. The results showed that there was less of an effect of noise on sleep in real-life conditions than had been previously reported from laboratory studies.

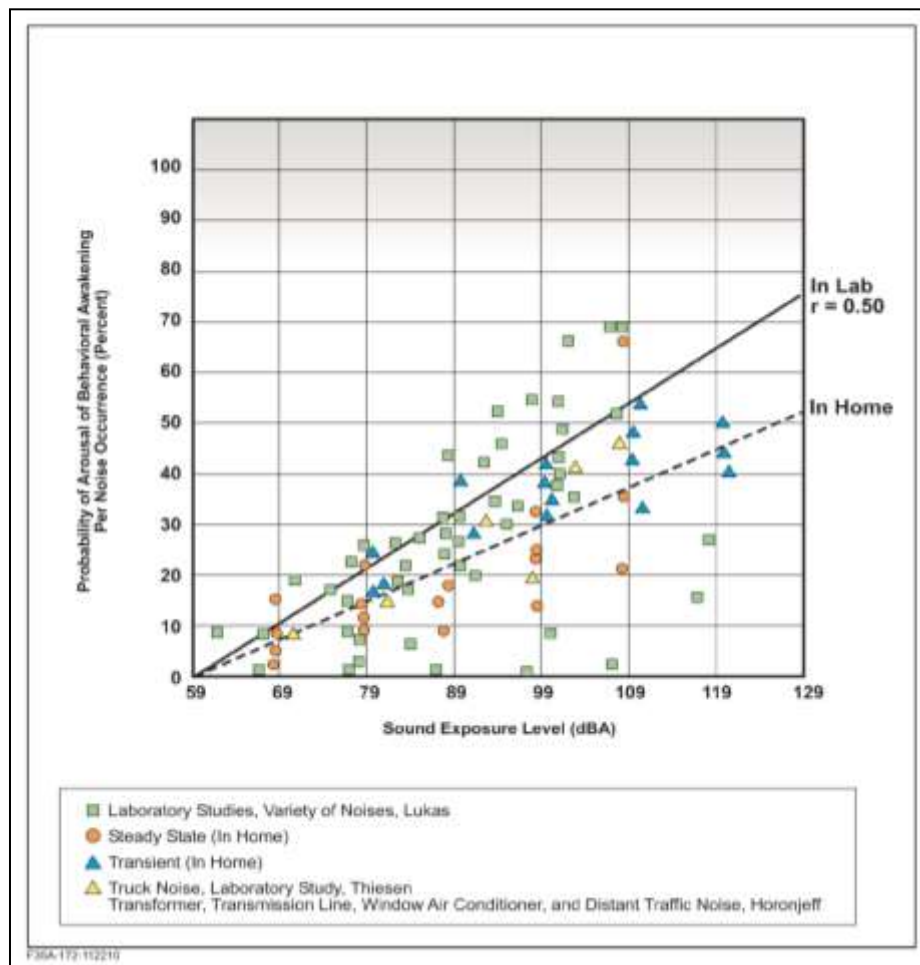


Figure H-4. Plot of Sleep Awakening Data versus Indoor SEL

The interim Federal Interagency Committee on Noise (FICON) dose-response curve that was recommended for use in 1992 was based on the most pertinent sleep

disturbance research that was conducted through the 1970s, primarily in laboratory settings. After that time, considerable field research was conducted to evaluate the sleep effects in peoples' normal, home environment. Laboratory sleep studies tend to show higher values of sleep disturbance than field studies because people who sleep in their own homes are habituated to their environment and, therefore, do not wake up as easily (FICAN 1997).

Based on the new information, the Federal Interagency Committee on Aircraft Noise (FICAN) updated its recommended dose-response curve in 1997, depicted as the lower curve in [Figure H-5](#). This figure is based on the results of three field studies (Ollerhead et al. 1992; Fidell et al. 1994; Fidell et al. 1995a and 1995b), along with the datasets from six previous field studies.

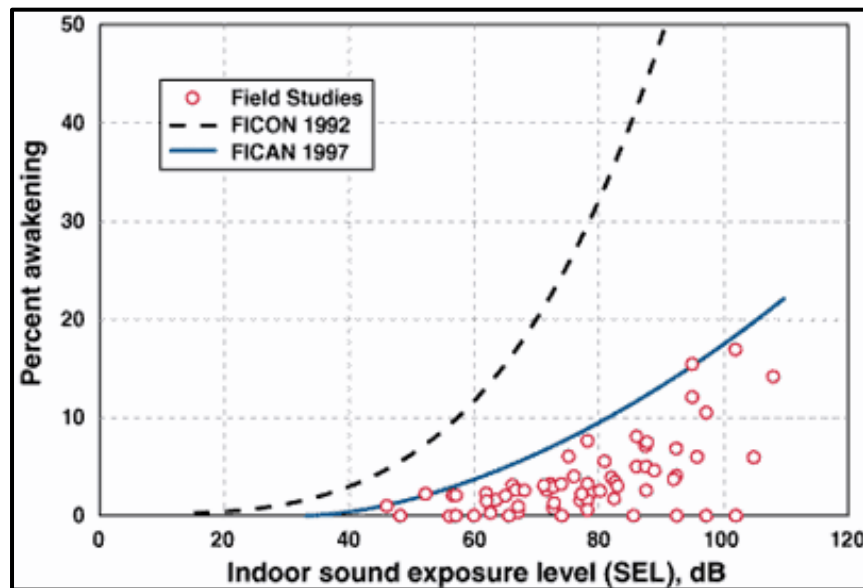


Figure H-5. FICAN's 1997 Recommended Sleep Disturbance Dose-Response Relationship

The new relationship represents the higher end, or upper envelope, of the latest field data. It should be interpreted as predicting the “maximum percent of the exposed population expected to be behaviorally awakened” or the “maximum percent awakened” for a given residential population. According to this relationship, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB, compared to 10 percent using the 1992 curve. An indoor SEL of 58 dB is equivalent to outdoor SEL's of 73 and 83 dB respectively assuming 15 and 25 dB noise level reduction from outdoor to indoor with windows open and closed, respectively.

The FICAN 1997 curve is represented by the following equation:

$$\text{Percent Awakenings} = 0.0087 \times [\text{SEL} - 30]^{1.79}$$

Note the relatively low percentage of awakenings to fairly high noise levels. People think they are awakened by a noise event, but usually the reason for awakening is otherwise. For example, the 1992 UK CAA study found the average person was awakened about 18 times per night for reasons other than exposure to an aircraft noise

– some of these awakenings are due to the biological rhythms of sleep and some to other reasons that were not correlated with specific aircraft events.

In July 2008 ANSI and the Acoustical Society of America (ASA) published a method to estimate the percent of the exposed population that might be awakened by multiple aircraft noise events based on statistical assumptions about the probability of awakening (or not awakening) (ANSI 2008). This method relies on probability theory rather than direct field research/experimental data to account for multiple events.

[Figure H-6](#) depicts the awakenings data that form the basis and equations of ANSI (2008). The curve labeled 'Eq. (B1)' is the relationship between noise and awakening endorsed by FICAN in 1997. The ANSI recommended curve labeled 'Eq. 1)' quantifies the probability of awakening for a population of sleepers who are exposed to an outdoor noise event as a function of the associated indoor SEL in the bedroom. This curve was derived from studies of behavioral awakenings associated with noise events in “steady state” situations where the population has been exposed to the noise long enough to be habituated. The data points in [Figure H-6](#) come from these studies. Unlike the FICAN curve, the ANSI 2008 curve represents the average of the field research data points.

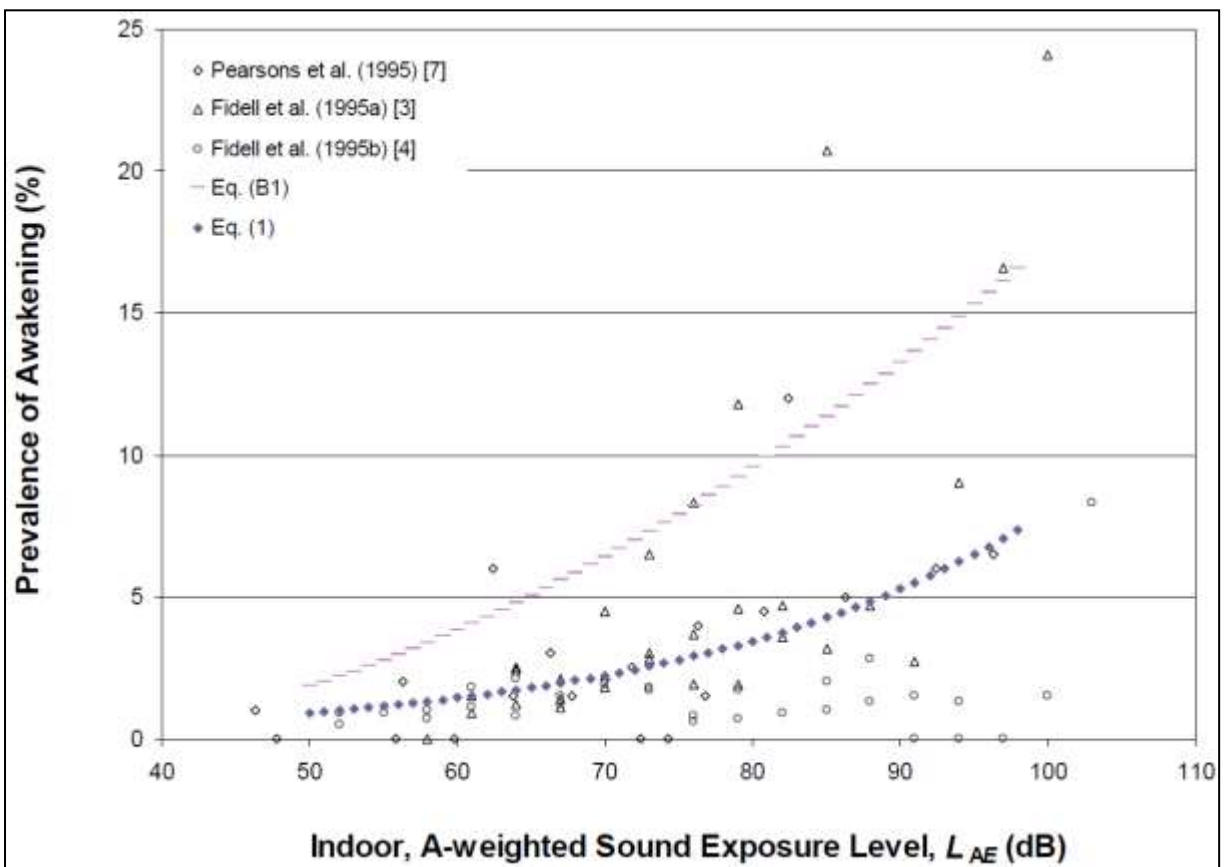


Figure H-6. Relation Between Indoor SEL and Percentage of Persons Awakened as Stated in ANSI/ASA S12.9-2008/Part 6

In December 2008, FICAN recommended the use of this new estimation procedure for future analyses of behavioral awakenings from aircraft noise. In that statement, FICAN also recognized that additional sleep disturbance research is underway by various

research organizations, and results of that work may result in additional changes to FICAN's position. Until that time, FICAN recommends the use of ANSI (2008).

H.2.4 Noise-Induced Hearing Impairment

Residents in surrounding communities express concerns regarding the effects of aircraft noise on hearing. This section provides a brief overview of hearing loss caused by noise exposure. The goal is to provide a sense of perspective as to how aircraft noise (as experienced on the ground) compares to other activities that are often linked with hearing loss.

Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound; i.e. a shift in the hearing threshold to a higher level. This change can either be a Temporary Threshold Shift (TTS), or a Permanent Threshold Shift (PTS) (Berger et al. 1995). TTS can result from exposure to loud noise over a given amount of time, yet the hearing loss is not necessarily permanent. An example of TTS might be a person attending a loud music concert. After the concert is over, the person may experience a threshold shift that may last several hours, depending upon the level and duration of exposure. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the speech range (typically near 4,000 Hz). Normal hearing ability eventually returns, as long as the person has enough time to recover within a relatively quiet environment.

PTS usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover from the strain and fatigue of exposure. A common example of PTS is the result of working in a loud environment such as a factory. It is important to note that a temporary shift (TTS) can eventually become permanent (PTS) over time with continuous exposure to high noise levels. Thus, even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a TTS results in a PTS is difficult to identify and varies with a person's sensitivity.

Considerable data on hearing loss have been collected and analyzed by the scientific/medical community. It has been well established that continuous exposure to high noise levels will damage human hearing (EPA 1978). The Occupational Safety and Health Administration (OSHA) regulation of 1971 standardizes the limits on workplace noise exposure for protection from hearing loss as an average level of 90 dB over an 8-hour work period or 85 dB over a 16-hour period (the average level is based on a 5 dB decrease per doubling of exposure time) (DoL 1971). Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) is an average sound level of 70 dB over a 24-hour period.

The EPA established 75 dB for an 8-hour exposure and 70 dB for a 24-hour exposure as the average noise level standard requisite to protect 96 percent of the population from greater than a 5 dB PTS (EPA 1978). The National Academy of Sciences Committee on Hearing, Bioacoustics, and Biomechanics identified 75 dB as the minimum level at which hearing loss may occur (CHABA 1977). Finally, the World Health Organization (WHO) has concluded that environmental and leisure-time noise

below an L_{eq24} value of 70 dB “will not cause hearing loss in the large majority of the population, even after a lifetime of exposure” (WHO 2000).

H.2.4.1 Hearing Loss and Aircraft Noise

The 1982 EPA Guidelines report specifically addresses the criteria and procedures for assessing the noise-induced hearing loss in terms of the Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in hearing level, or threshold, caused by exposure to noise (EPA 1982). This effect is also described as Potential Hearing Loss (PHL). Numerically, the NIPTS is the change in threshold averaged over the frequencies 0.5, 1, 2, and 4 kHz that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure beginning at an age of 20 years. A grand average of the NIPTS over time (40 years) and hearing sensitivity (10 to 90 percentiles of the exposed population) is termed the Average NIPTS, or Ave NIPTS for short. The Average Noise Induced Permanent Threshold Shift (Ave. NIPTS) that can be expected for noise exposure as measured by the DNL metric is given in [Table H-3](#).

Table H-3. Average NIPTS and 10th Percentile NIPTS as a Function of DNL

DNL	Ave. NIPTS dB*	10 th Percentile NIPTS dB*
75–76	1.0	4.0
76–77	1.0	4.5
77–78	1.6	5.0
78–79	2.0	5.5
79–80	2.5	6.0
80–81	3.0	7.0
81–82	3.5	8.0
82–83	4.0	9.0
83–84	4.5	10.0
84–85	5.5	11.0
85–86	6.0	12.0
86–87	7.0	13.5
87–88	7.5	15.0
88–89	8.5	16.5
89–90	9.5	18.0

Note: * Rounded to the nearest 0.5 dB.

For example, for a noise exposure of 80 dB DNL, the expected lifetime average value of NIPTS is 2.5 dB, or 6.0 dB for the 10th percentile. Characterizing the noise exposure in terms of DNL will usually overestimate the assessment of hearing loss risk as DNL includes a 10 dB weighting factor for aircraft operations occurring between 10 p.m. and 7 a.m. If, however, flight operations between the hours of 10 p.m. and 7 a.m. account for 5 percent or less of the total 24-hour operations, the overestimation is on the order of 1.5 dB.

From a civilian airport perspective, the scientific community has concluded that there is little likelihood that the resulting noise exposure from aircraft noise could result in either a temporary or permanent hearing loss. Studies on community hearing loss from exposure to aircraft flyovers near airports showed that there is no danger, under normal circumstances, of hearing loss due to aircraft noise (Newman and Beattie 1985). The EPA criterion ($L_{eq24} = 70$ dBA) can be exceeded in some areas located near airports, but that is only the case outdoors. Inside a building, where people are more likely to spend most of their time, the average noise level will be much less than 70 dBA (Eldred and von Gierke 1993). Eldred and von Gierke also report that “several studies in the U.S., Japan, and the U.K. have confirmed the predictions that the possibility for permanent hearing loss in communities, even under the most intense commercial take-off and landing patterns, is remote.”

With regard to military airbases, as individual aircraft noise levels are increasing with the introduction of new aircraft, a 2009 DoD policy directive requires that hearing loss risk be estimated for the at risk population, defined as the population exposed to DNL greater than or equal to 80 dB and higher (DoD 2009). Specifically, DoD components are directed to “*use the 80 Day-Night A-Weighted (DNL) noise contour to identify populations at the most risk of potential hearing loss.*” This does not preclude populations outside the 80 DNL contour, i.e. at lower exposure levels, from being at some degree of risk of hearing loss. However, the analysis should be restricted to populations within this contour area, including residents of on-base housing. The exposure of workers inside the base boundary area should be considered occupational and evaluated using the appropriate DoD component regulations for occupational noise exposure.

With regard to military airspace activity, studies have shown conflicting results. A 1995 laboratory study measured changes in human hearing from noise representative of low-flying aircraft on Military Training Routes (MTRs) (Nixon et al. 1993). The potential effects of aircraft flying along MTRs is of particular concern because of maximum overflight noise levels can exceed 115 dB, with rapid increases in noise levels exceeding 30 dB per second. In this study, participants were first subjected to four overflight noise exposures at A-weighted levels of 115 dB to 130 dB. Fifty percent of the subjects showed no change in hearing levels, 25 percent had a temporary 5 dB *increase* in sensitivity (the people could hear a 5 dB wider range of sound than before exposure), and 25 percent had a temporary 5 dB decrease in sensitivity (the people could hear a 5 dB narrower range of sound than before exposure). In the next phase, participants were subjected to a single overflight at a maximum level of 130 dB for eight successive exposures, separated by 90 seconds or until a temporary shift in hearing was observed. The temporary hearing threshold shifts showed an increase in sensitivity of up to 10 dB.

In another study of 115 test subjects between 18 and 50 years old in 1999, temporary threshold shifts were measured after laboratory exposure to military low-altitude flight noise (Ising et al. 1999). According to the authors, the results indicate that repeated exposure to military low-altitude flight noise with L_{max} greater than 114 dB, especially if the noise level increases rapidly, may have the potential to cause noise induced hearing loss in humans.

Aviation and typical community noise levels near airports are not comparable to the occupational or recreational noise exposures associated with hearing loss. Studies of aircraft noise levels associated with civilian airport activity have not definitively correlated permanent hearing impairment with aircraft activity. It is unlikely that airport neighbors will remain outside their homes 24 hours per day, so there is little likelihood of hearing loss below an average sound level of 75 dB DNL. Near military airbases, average noise levels above 75 dB may occur, and while new DoD policy dictates that NIPTS be evaluated, no research results to date have definitively related permanent hearing impairment to aviation noise.

H.2.5 Nonauditory Health Effects

Studies have been conducted to determine whether correlations exist between noise exposure and cardiovascular problems, birth weight, and mortality rates. The nonauditory effect of noise on humans is not as easily substantiated as the effect on hearing. Prolonged stress is known to be a contributor to a number of health disorders. Kryter and Poza (1980) state, "It is more likely that noise-related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body." Psychological stresses may cause a physiological stress reaction that could result in impaired health. The National Institute for Occupational Safety and Health (NIOSH) and EPA commissioned the Committee on Hearing, Bioacoustics and Biomechanics (CHABA) in 1981 to study whether established noise standards are adequate to protect against health disorders other than hearing defects. CHABA's conclusion was that:

Evidence from available research reports is suggestive, but it does not provide definitive answers to the question of health effects, other than to the auditory system, of long-term exposure to noise. It seems prudent, therefore, in the absence of adequate knowledge as to whether or not noise can produce effects upon health other than damage to auditory system, either directly or mediated through stress, that insofar as feasible, an attempt should be made to obtain more critical evidence.

Since the CHABA report, there have been further studies that suggest that noise exposure may cause hypertension and other stress-related effects in adults. Near an airport in Stockholm, Sweden, the prevalence of hypertension was reportedly greater among nearby residents who were exposed to energy averaged noise levels exceeding 55 dB and maximum noise levels exceeding 72 dB, particularly older subjects and those not reporting impaired hearing ability (Rosenlund et al. 2001). A study of elderly volunteers who were exposed to simulated military low-altitude flight noise reported that blood pressure was raised by L_{\max} of 112 dB and high speed level increase (Michalak et al. 1990). Yet another study of subjects exposed to varying levels of military aircraft or road noise found no significant relationship between noise level and blood pressure (Pulles et al. 1990).

Most studies of nonauditory health effects of long-term noise exposure have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. One of the best scientific summaries of these findings is contained in the lead paper at the National

Institutes of Health Conference on Noise and Hearing Loss, held on 22 to 24 January 1990 in Washington, D.C.:

The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an 8-hour day).

At the 1988 International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem, but also any potential nonauditory health effects in the work place” (von Gierke 1990).

Although these findings were specifically directed at noise effects in the workplace, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies that purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, two University of California, Los Angeles (UCLA) researchers apparently found a relationship between aircraft noise levels under the approach path to Los Angeles International Airport and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the “noise-exposed” population (Meacham and Shaw 1979). Nevertheless, three other UCLA professors analyzed those same data and found no relationship between noise exposure and mortality rates (Frerichs, et al. 1980).

As a second example, two other UCLA researchers used this same population near LAX to show a higher rate of birth defects for 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the Center for Disease Control performed a more thorough study of populations near Atlanta’s Hartsfield International Airport for 1970 to 1972 and found no relationship in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds et al. 1979).

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time average sound levels below 75 dB. The potential for noise to affect physiological health, such as the cardiovascular system, has been speculated; however, no unequivocal evidence exists to support such claims (Harris 1997). Conclusions drawn from a review of health effect studies involving military low-altitude flight noise with its unusually high maximum levels and rapid rise in sound level have shown no increase in cardiovascular disease (Schwarze and Thompson 1993). Additional claims that are unsupported include flyover noise producing increased mortality rates and increases in cardiovascular death, aggravation of post-traumatic stress syndrome, increased stress, increases in admissions to mental hospitals, and adverse effects on pregnant women and the unborn fetus (Harris 1997).

H.2.6 Performance Effects

The effect of noise on the performance of activities or tasks has been the subject of many studies. Some of these studies have established links between continuous high noise levels and performance loss. Noise-induced performance losses are most frequently reported in studies employing noise levels in excess of 85 dB. Little change has been found in low-noise cases. It has been cited that moderate noise levels appear to act as a stressor for more sensitive individuals performing a difficult psychomotor task. While the results of research on the general effect of periodic aircraft noise on performance have yet to yield definitive criteria, several general trends have been noted including:

- A periodic intermittent noise is more likely to disrupt performance than a steady-state continuous noise of the same level. Flyover noise, due to its intermittent nature, might be more likely to disrupt performance than a steady-state noise of equal level.
- Noise is more inclined to affect the quality than the quantity of work.
- Noise is more likely to impair the performance of tasks that place extreme demands on the worker.

H.2.7 Noise Effects on Children

In response to noise-specific and other environmental studies, Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (1997), requires Federal agencies to ensure that policies, programs, and activities address environmental health and safety risks to identify any disproportionate risks to children.

A review of the scientific literature indicates that there has not been a tremendous amount of research in the area of aircraft noise effects on children. The research reviewed does suggest that environments with sustained high background noise can have variable effects, including noise effects on learning and cognitive abilities, and reports of various noise-related physiological changes.

H.2.7.1 Effects on Learning and Cognitive Abilities

In 2002 ANSI refers to studies that suggest that loud and frequent background noise can affect the learning patterns of young children (ANSI 2002). ANSI provides discussion on the relationships between noise and learning, and stipulates design requirements and acoustical performance criteria for outdoor-to-indoor noise isolation. School design is directed to be cognizant of, and responsive to surrounding land uses and the shielding of outdoor noise from the indoor environment. The ANSI acoustical performance criteria for schools include the requirement that the 1-hour-average background noise level shall not exceed 35 dBA in core learning spaces smaller than 20,000 cubic-feet and 40 dBA in core learning spaces with enclosed volumes exceeding 20,000 cubic-feet. This would require schools be constructed such that, in quiet neighborhoods indoor noise levels are lowered by 15 to 20 dBA relative to outdoor levels. In schools near airports, indoor noise levels would have to be lowered by 35 to 45 dBA relative to outdoor levels (ANSI 2002).

The studies referenced by ANSI to support the new standard are not specific to jet aircraft noise and the potential effects on children. However, there are references to studies that have shown that children in noisier classrooms scored lower on a variety of tests. Excessive background noise or reverberation within schools causes interferences of communication and can therefore create an acoustical barrier to learning (ANSI 2002). Studies have been performed that contribute to the body of evidence emphasizing the importance of communication by way of the spoken language to the development of cognitive skills. The ability to read, write, comprehend, and maintain attentiveness, are, in part, based upon whether teacher communication is consistently intelligible (ANSI 2002).

Numerous studies have shown varying degrees of effects of noise on the reading comprehension, attentiveness, puzzle-solving, and memory/recall ability of children. It is generally accepted that young children are more susceptible than adults to the effects of background noise. Because of the developmental status of young children (linguistic, cognitive, and proficiency), barriers to hearing can cause interferences or disruptions in developmental evolution.

Research on the impacts of aircraft noise, and noise in general, on the cognitive abilities of school-aged children has received more attention in the last 20 years. Several studies suggest that aircraft noise can affect the academic performance of schoolchildren. Although many factors could contribute to learning deficits in school-aged children (e.g., socioeconomic level, home environment, diet, sleep patterns), evidence exists that suggests that chronic exposure to high aircraft noise levels can impair learning. Specifically, elementary school children attending schools near New York City's two airports demonstrated lower reading scores than children living farther away from the flight paths (Green et al. 1982). Researchers have found that tasks involving central processing and language comprehension (such as reading, attention, problem solving, and memory) appear to be the most affected by noise (Evans and Lepore 1993, Evans et al. 1998). It has been demonstrated that chronic exposure of first- and second-grade children to aircraft noise can result in reading deficits and impaired speech perception (i.e., the ability to hear common, low-frequency [vowel] sounds but not high frequencies [consonants] in speech) (Evans and Maxwell 1997).

The Evans and Maxwell (1997) study found that chronic exposure to aircraft noise resulted in reading deficits and impaired speech perception for first- and second-grade children. Other studies found that children residing near the Los Angeles International Airport had more difficulty solving cognitive problems and did not perform as well as children from quieter schools in puzzle-solving and attentiveness (Bronzaft 1997, Cohen et al. 1980). Children attending elementary schools in high aircraft noise areas near London's Heathrow Airport demonstrated poorer reading comprehension and selective cognitive impairments (Haines et al. 2001a, 2001b). Similar studies involving the testing of attention, memory, and reading comprehension of school children located near airports showed that their tests exhibited reduced performance results compared to those of similar groups of children who were located in quieter environments (Evans et al. 1998, Haines et al. 1998). The Haines and Stansfeld study indicated that there may be some long-term effects associated with exposure, as one-year follow-up testing still demonstrated lowered scores for children in higher noise schools (Haines et al. 2001a, 2001b). In contrast, a 2002 study found that although children living near the old

Munich airport scored lower in standardized reading and long-term memory tests than a control group, their performance on the same tests were equal to that of the control group once the airport was closed (Hygge et al. 2002).

Finally, although it is recognized that there are many factors that could contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led the WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (WHO 2000, NATO 2000).

H.2.7.2 Health Effects

Physiological effects in children exposed to aircraft noise and the potential for health effects have also been the focus of limited investigation. Studies in the literature include examination of blood pressure levels, hormonal secretions, and hearing loss.

As a measure of stress response to aircraft noise, authors have looked at blood pressure readings to monitor children's health. Children who were chronically exposed to aircraft noise from a new airport near Munich, Germany, had modest (although significant) increases in blood pressure, significant increases in stress hormones, and a decline in quality of life (Evans et al. 1998). Children attending noisy schools had statistically significant average systolic and diastolic blood pressure ($p < 0.03$). Systolic blood pressure means were 89.68 mm for children attending schools located in noisier environments compared to 86.77 mm for a control group. Similarly, diastolic blood pressure means for the noisier environment group were 47.84 mm and 45.16 for the control group (Cohen et al. 1980).

Although the literature appears limited, studies focused on the wide range of potential effects of aircraft noise on school children have also investigated hormonal levels between groups of children exposed to aircraft noise compared to those in a control group. Specifically, two studies analyzed cortisol and urinary catecholamine levels in school children as measurements of stress response to aircraft noise (Haines et al. 2001b, 2001c). In both instances, there were no differences between the aircraft-noise-exposed children and the control groups.

Other studies have reported hearing losses from exposure to aircraft noise. Noise-induced hearing loss was reportedly higher in children who attended a school located under a flight path near a Taiwan airport, as compared to children at another school far away (Chen et al. 1997). Another study reported that hearing ability was reduced significantly in individuals who lived near an airport and were frequently exposed to aircraft noise (Chen and Chen 1993). In that study, noise exposure near the airport was reportedly uniform, with DNL greater than 75 dB and maximum noise levels of about 87 dB during overflights. Conversely, several other studies that were reviewed reported no difference in hearing ability between children exposed to high levels of airport noise and children located in quieter areas (Fisch 1977, Andrus et al. 1975, Wu et al. 1995).

H.2.8 Noise Effects on Domestic Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Mancini et al. (1988) assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intra-inter specific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed outlines those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and the introduction of supersonic jet aircraft. According to Mancini et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and others that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or interfere with behavioral patterns (Mancini et al. 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate and attract other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights. Secondary effects may include non-auditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food,

cover, or water. Tertiary effects are the direct result of primary and secondary effects. These include population decline and habitat loss. Most of the effects of noise are mild enough to be undetectable as variables of change in population size or population growth against the background of normal variation (Bowles 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al. 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci et al. 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife “flight” due to noise. Apparently, animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al. 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the 1988 Manci et al. literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been previous exposures. Responses range from flight, trampling, stampeding, jumping, or running to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

H.2.8.1 Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights, but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al. 1988). Some studies have reported primary and secondary effects including reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies and claims by farmers linking adverse effects of aircraft noise on livestock did not necessarily provide clear-cut evidence of cause and effect (Cottureau 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Cattle. In response to concerns about overflight effects on pregnant cattle, milk production, and cattle safety, the U.S. Air Force prepared a handbook for environmental protection that summarizes the literature on the impacts of low-altitude flights on livestock (and poultry), and includes specific case studies conducted in numerous airspaces across the country. Adverse effects have been found in a few studies, but have not been reproduced in other similar studies. One such study, conducted in 1983, suggested that 2 of 10 cows in late pregnancy aborted after showing rising estrogen and falling progesterone levels. These increased hormonal levels were reported as being linked to 59 aircraft overflights. The remaining eight cows showed no changes in their blood concentrations and calved normally (Air Force 1994). A similar study reported that abortions occurred in three out of five pregnant cattle after exposing them to flyovers by six different aircraft (Air Force 1994). Another study suggested that feedlot cattle could stampede and injure themselves when exposed to low-level overflights (Air Force 1994).

A majority of the studies reviewed suggest that there is little or no effect of aircraft noise on cattle. Studies presenting adverse effects on domestic animals have been limited. A number of studies (Parker and Bayley 1960; Kovalcik and Sottnik 1971) investigated the effects of jet aircraft noise and sonic booms on the milk production of dairy cows. Through the compilation and examination of milk production data from areas exposed to jet aircraft noise and sonic boom events, it was determined that milk yields were not affected. This was particularly evident in those cows that had been previously exposed to jet aircraft noise.

One study examined the causes of 1,763 abortions in Wisconsin dairy cattle over a one-year time period, and none were associated with aircraft disturbances (Air Force 1993). In 1987, Anderson contacted seven livestock operators for production data, and no effects of low-altitude and supersonic flights were noted. Three out of 43 cattle previously exposed to low-altitude flights showed a startle response to an F/A-18 aircraft flying overhead at 500 feet above ground level at 400 knots by running less than 10 meters. They resumed normal activity within one minute (Air Force 1994). In 1983, Beyer found that helicopters caused more reaction than other low-aircraft overflights. A 1964 study also found that helicopters flying 30 to 60 feet overhead did not affect milk production and pregnancies of 44 cows and heifers (Air Force 1994).

Additionally, Beyer reported that five pregnant dairy cows in a pasture did not exhibit fright-flight tendencies or have their pregnancies disrupted after being overflown by 79 low-altitude helicopter flights and 4 low-altitude, subsonic jet aircraft flights (Air Force 1994). A 1956 study found that the reactions of dairy and beef cattle to noise from low-altitude, subsonic aircraft were similar to those caused by paper blowing about, strange persons, or other moving objects (Air Force 1994).

In a report to Congress, the U. S. Forest Service concluded that “evidence both from field studies of wild ungulates and laboratory studies of domestic stock indicate that the risks of damage are small (from aircraft approaches of 50 to 100 meters), as animals take care not to damage themselves (USFS 1992). If animals are overflown by aircraft at altitudes of 50 to 100 meters, there is no evidence that mothers and young are separated, that animals collide with obstructions (unless confined) or that they traverse dangerous ground at too high a rate.” These varied study results suggest that, although

the confining of cattle could magnify animal response to aircraft overflight, there is no proven cause-and-effect link between startling cattle from aircraft overflights and abortion rates or lower milk production.

Horses. Horses have also been observed to react to overflights of jet aircraft. Several of the studies reviewed reported a varied response of horses to low-altitude aircraft overflights. Observations made in 1966 and 1968 noted that horses galloped in response to jet flyovers (Air Force 1993). In 1995, Bowles cites Kruger and Erath as observing horses exhibiting intensive flight reactions, random movements, and biting/kicking behavior. However, no injuries or abortions occurred, and there was evidence that the mares adapted somewhat to the flyovers over the course of a month (Air Force 1994). Although horses were observed noticing the overflights, it did not appear to affect either survivability or reproductive success. There was also some indication that habituation to these types of disturbances was occurring.

LeBlanc et al. studied the effects of F-14 jet aircraft noise on pregnant mares (1991). They specifically focused on any changes in pregnancy success, behavior, cardiac function, hormonal production, and rate of habituation. Their findings reported observations of “flight-fright” reactions, which caused increases in heart rates and serum cortisol concentrations. The mares, however, did habituate to the noise. Levels of anxiety and mass body movements were the highest after initial exposure, with intensities of responses decreasing thereafter. There were no differences in pregnancy success when compared to a control group.

Swine. Generally, the literature findings for swine appear to be similar to those reported for cows and horses. While there are some effects from aircraft noise reported in the literature, these effects are minor. Studies of continuous noise exposure (i.e., 6 hours or 72 hours of constant exposure) reported influences on short-term hormonal production and release. Additional constant exposure studies indicated the observation of stress reactions, hypertension, and electrolyte imbalances (Dufour 1980). A study by Bond et al. demonstrated no adverse effects on the feeding efficiency, weight gain, ear physiology, or thyroid and adrenal gland condition of pigs subjected to aircraft noise (1963). Observations of heart rate increase were recorded and it was noted that cessation of the noise resulted in the return to normal heart rates. Conception rates and offspring survivorship did not appear to be influenced by exposure to aircraft noise.

Similarly, simulated aircraft noise at levels of 100 dB to 135 dB had only minor effects on the rate of feed utilization, weight gain, food intake, and reproduction rates of boars and sows exposed, and there were no injuries or inner ear changes observed (Manci et al. 1988; Gladwin et al. 1988).

Domestic Fowl. According to a 1994 position paper by the U.S. Air Force on effects of low-altitude overflights (below 1,000 feet) on domestic fowl, overflight activity has negligible effects (Air Force 1994). The paper did recognize that given certain circumstances, adverse effects can be serious. Some of the effects can be panic reactions, reduced productivity, and effects on marketability (e.g., bruising of the meat caused during “pile-up” situations).

The typical reaction of domestic fowl after exposure to sudden, intense noise is a short-term startle response. The reaction ceases as soon as the stimulus is ended, and

within a few minutes all activity returns to normal. More severe responses are possible depending on the number of birds, the frequency of exposure, and environmental conditions. Large crowds of birds and birds not previously exposed are more likely to pile up in response to a noise stimulus (Air Force 1994). According to studies and interviews with growers, it is typically the previously unexposed birds that incite panic crowding, and the tendency to do so is markedly reduced within five exposures to the stimulus (Air Force 1994). This suggests that the birds habituate relatively quickly. Egg productivity was not adversely affected by infrequent noise bursts, even at exposure levels as high as 120 to 130 dBA.

Between 1956 and 1988, there were 100 recorded claims against the Navy for alleged damage to domestic fowl. The number of claims averaged three per year, with peak numbers of claims following publications of studies on the topic in the early 1960s (Air Force 1994). Many of the claims were disproved or did not have sufficient supporting evidence. The claims were filed for the following alleged damages: 55 percent for panic reactions, 31 percent for decreased production, 6 percent for reduced hatchability, 6 percent for weight loss, and less than 1 percent for reduced fertility (Air Force 1994).

Turkeys. The review of the existing literature suggests that there has not been a concerted or widespread effort to study the effects of aircraft noise on commercial turkeys. One study involving turkeys examined the differences between simulated versus actual overflight aircraft noise, turkey responses to the noise, weight gain, and evidence of habituation (Bowles et al. 1990). Findings from the study suggested that turkeys habituated to jet aircraft noise quickly, that there were no growth rate differences between the experimental and control groups, and that there were some behavioral differences that increased the difficulty in handling individuals within the experimental group.

Low-altitude overflights were shown to cause turkey flocks which were kept inside turkey houses to occasionally pile up and experience high mortality rates due to the aircraft noise and a variety of disturbances unrelated to aircraft (Air Force 1994).

H.2.8.2 Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (NPS 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock (Manci et al. 1988). This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al. 1988).

H.2.8.3 Mammals

Terrestrial Mammals. Studies of terrestrial mammals have shown that noise levels of 120 dBA can damage mammals' ears, and levels of 95 dBA can cause temporary loss

of hearing acuity. Noise from aircraft has affected other large carnivores by causing changes in home ranges, foraging patterns, and breeding behavior. One study recommended that aircraft not be allowed to fly at altitudes below 2,000 feet above ground level over important grizzly and polar bear habitat (Dufour 1980). Wolves have been frightened by low-altitude flights that were 25 to 1,000 feet off the ground. However, wolves have been found to adapt to aircraft overflights and noise as long as they were not being hunted from aircraft (Dufour 1980).

Wild ungulates (American bison, caribou, bighorn sheep) appear to be much more sensitive to noise disturbance than domestic livestock (Weisenberger et al. 1996). Behavioral reactions may be related to the past history of disturbances by such things as humans and aircraft. Common reactions of reindeer kept in an enclosure and exposed to aircraft noise disturbance were a slight startle response, raising of the head, pricking ears, and scenting of the air. Panic reactions and extensive changes in behavior of individual animals were not observed. Observations of caribou in Alaska exposed to fixed-wing aircraft and helicopters showed running and panic reactions occurred when overflights were at an altitude of 200 feet or less. The reactions decreased with increased altitude of overflights, and for overflights higher than 500 feet in altitude, the panic reactions stopped. Also, smaller groups reacted less strongly than larger groups. One negative effect of the running and avoidance behavior is increased expenditure of energy. For a 90-kilogram animal, the calculated expenditure due to aircraft harassment is 64 kilocalories per minute when running and 20 kilocalories per minute when walking. When conditions are favorable, this expenditure can be counteracted with increased feeding; however, during harsh winter conditions, this may not be possible. Incidental observations of wolves and bears exposed to fixed-wing aircraft and helicopters suggested that wolves were less disturbed than wild ungulates, while grizzly bears showed the greatest response of any animal species observed.

It has been proven that low-altitude overflights do induce stress in animals. Increased heart rates, an indicator of excitement or stress, have been found in pronghorn antelope, elk, and bighorn sheep. These reactions occur naturally as a response to predation, so infrequent overflights may not, in and of themselves, be detrimental. However, flights at high frequencies over a long period of time may cause harmful effects. The consequences of this disturbance, while cumulative, are not additive. Aircraft disturbance may not cause obvious and serious health effects, but coupled with a harsh winter, it may have an adverse impact. Research has shown that stress induced by other types of disturbances produces long-term decreases in metabolism and hormone balances in wild ungulates.

Behavioral responses can range from mild to severe. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate disturbance may be nervous behaviors, such as trotting a short distance. Escape is the typical severe response.

Marine Mammals. The physiological composition of the ear in aquatic and marine mammals exhibits adaptation to the aqueous environment. These differences (relative to terrestrial species) manifest themselves in the auricle and middle ear (Manci et al. 1988). Some mammals use echolocation to perceive objects in their surroundings and

to determine the directions and locations of sound sources (Simmons 1983 in Mancini et al. 1988).

Research conducted on northern fur seals, sea lions, and ringed seals indicated that there are some differences in how various animal groups receive frequencies of sound. It was observed that these species exhibited varying intensities of a startle response to airborne noise, which was habituated over time. The rates of habituation appeared to vary with species, populations, and demographics (age, sex). Time of day of exposure was also a factor (Muyberg 1978 in Mancini et al. 1988).

Studies accomplished near the Channel Islands were conducted near the area where the space shuttle launches occur. It was found that there were some response differences between species relative to the loudness of sonic booms. Those booms that were between 80 and 89 dBA caused a greater intensity of startle reactions than lower-intensity booms at 72 to 79 dBA. However, the duration of the startle responses to louder sonic booms was shorter (Jehl and Cooper 1980 in Mancini et al. 1988).

Jehl and Cooper indicated that low-flying helicopters, loud boat noises, and humans were the most disturbing to pinnipeds (1980). According to the research, although the space launch and associated operational activity noises have not had a measurable effect on the pinniped population, it also suggests that there was a greater “disturbance level” exhibited during launch activities. There was a recommendation to continue observations for behavioral effects and to perform long-term population monitoring (Jehl and Cooper 1980).

The continued presence of single or multiple noise sources could cause marine mammals to leave a preferred habitat. However, it does not appear likely that overflights could cause migration from suitable habitats because aircraft noise over water is mobile and would not persist over any particular area. Aircraft noise, including supersonic noise, currently occurs in the overwater airspace of Eglin, Tyndall, and Langley Air Force Bases (AFBs) from sorties predominantly involving jet aircraft. Survey results reported in Davis et al. indicate that cetaceans (i.e., dolphins) occur under all of the Eglin and Tyndall marine airspace (2000). The continuing presence of dolphins indicates that aircraft noise does not discourage use of the area and apparently does not harm the locally occurring population.

In a summary by the National Parks Service on the effects of noise on marine mammals, it was determined that gray whales and harbor porpoises showed no outward behavioral response to aircraft noise or overflights (1994). Bottlenose dolphins showed no obvious reaction in a study involving helicopter overflights at 1,200 to 1,800 feet above the water. They also did not show any reaction to survey aircraft unless the shadow of the aircraft passed over them, at which point there was some observed tendency to dive (Richardson et al. 1995). Other anthropogenic noises in the marine environment from ships and pleasure craft may have more of an effect on marine mammals than aircraft noise (Air Force 2000). The noise effects on cetaceans appear to be somewhat attenuated by the air/water interface.

Manatees appear relatively unresponsive to human-generated noise to the point that they are often suspected of being deaf to oncoming boats (although their hearing is actually similar to that of pinnipeds) (Bullock et al. 1980). Little is known about the

importance of acoustic communication to manatees, although they are known to produce at least ten different types of sounds and are thought to have sensitive hearing (Richardson et al. 1995).

H.2.8.4 Birds

Auditory research conducted on birds indicates that they fall between reptiles and mammals relative to hearing sensitivity. According to Dooling, within the range of 1,000 to 5,000 Hz, birds show a level of hearing sensitivity similar to that of the more sensitive mammals (1978). In contrast to mammals, bird sensitivity falls off at a greater rate with increasing and decreasing frequencies. Passive observations and studies examining aircraft bird strikes indicate that birds nest and forage near airports. Aircraft noise in the vicinity of commercial airports apparently does not inhibit bird presence and use.

High-noise events (like a low-altitude aircraft overflight) may cause birds to engage in escape or avoidance behaviors, such as flushing from perches or nests (Ellis et al. 1991). These activities impose an energy cost on the birds that, over the long term, may affect survival or growth. In addition, the birds may spend less time engaged in necessary activities like feeding, preening, or caring for their young because they spend time in noise-avoidance activity. However, the long-term significance of noise-related impacts is less clear. Several studies on nesting raptors have indicated that birds become habituated to aircraft overflights and that long-term reproductive success is not affected (Grubb and King 1991; Ellis et al. 1991). Threshold noise levels for significant responses range from 62 dB for Pacific black brant to 85 dB for crested tern (Ward and Stehn 1990; Brown 1990).

Songbirds were observed to become silent prior to the onset of a sonic boom event (F-111 jets), followed by “raucous discordant cries.” There was a return to normal singing within 10 seconds after the boom (Higgins 1974 in Mancini et al. 1988). Ravens responded by emitting protestation calls, flapping their wings, and soaring.

Mancini et al. reported a reduction in reproductive success in some small territorial passerines (i.e., perching birds or songbirds) after exposure to low-altitude overflights (1988). However, it has been observed that passerines are not driven any great distance from a favored food source by a nonspecific disturbance, such as aircraft overflights (USFS 1992). Further study may be warranted.

A recent study, conducted cooperatively between the DoD and the U.S. Fish and Wildlife Service (USFWS), assessed the response of the red-cockaded woodpecker to a range of military training noise events, including artillery, small arms, helicopter, and maneuver noise (Pater et al. 1999). The project findings show that the red-cockaded woodpecker successfully acclimates to military noise events. Depending on the noise level, which ranged from innocuous to very loud, the birds responded by flushing from their nest cavities. When the noise source was closer and the noise level was higher, the number of flushes increased proportionately. In all cases, however, the birds returned to their nests within a relatively short period of time (usually within 12 minutes). Additionally, the noise exposure did not result in any mortality or statistically detectable changes in reproductive success (Pater et al. 1999). Red-cockaded woodpeckers did

not flush when artillery simulators were more than 122 meters away and SEL noise levels were 70 dBA.

Lynch and Speake studied the effects of both real and simulated sonic booms on the nesting and brooding eastern wild turkey in Alabama (1978). Hens at four nest sites were subjected to between 8 and 11 combined real and simulated sonic booms. All tests elicited similar responses, including quick lifting of the head and apparent alertness for between 10 and 20 seconds. No apparent nest failure occurred as a result of the sonic booms.

Twenty-one brood groups were also subjected to simulated sonic booms. Reactions varied slightly between groups, but the largest percentage of groups reacted by standing motionless after the initial blast. Upon the sound of the boom, the hens and poults fled until reaching the edge of the woods (approximately 4 to 8 meters). Afterward, the poults resumed feeding activities while the hens remained alert for a short period of time (approximately 15 to 20 seconds). In no instances were poults abandoned, nor did they scatter and become lost. Every observation group returned to normal activities within a maximum of 30 seconds after a blast.

H.2.8.5 Raptors

In a literature review of raptor responses to aircraft noise, Mancini et al. found that most raptors did not show a negative response to overflights (1988). When negative responses were observed they were predominantly associated with rotor-winged aircraft or jet aircraft that were repeatedly passing within 0.5 mile of a nest.

Ellis et al. performed a study to estimate the effects of low-level military jet aircraft and mid-to high-altitude sonic booms (both actual and simulated) on nesting peregrine falcons and seven other raptors (common black-hawk, Harris' hawk, zone-tailed hawk, red-tailed hawk, golden eagle, prairie falcon, bald eagle) (1991). They observed responses to test stimuli, determined nest success for the year of the testing, and evaluated site occupancy the following year. Both long- and short-term effects were noted in the study. The results reported the successful fledging of young in 34 of 38 nest sites (all eight species) subjected to low-level flight and/or simulated sonic booms. Twenty-two of the test sites were revisited in the following year, and observations of pairs or lone birds were made at all but one nest. Nesting attempts were underway at 19 of 20 sites that were observed long enough to be certain of breeding activity. Re-occupancy and productivity rates were within or above expected values for self-sustaining populations.

Short-term behavior responses were also noted. Overflights at a distance of 150 meters or less produced few significant responses and no severe responses. Typical responses included crouching or, very rarely, flushing from the perch site. Significant responses were most evident before egg laying and after young were "well grown." Incubating or brooding adults never burst from the nest, thus preventing egg breaking or knocking chicks out of the nest. Jet passes and sonic booms often caused noticeable alarm; however, significant negative responses were rare and did not appear to limit productivity or re-occupancy. The locations of some of the nests may have caused some birds to be habituated to aircraft noise. There were some test sites located at

distances far from zones of frequent military aircraft usage, and the test stimuli were often closer, louder, and more frequent than would be likely for a normal training situation.

Manci et al. noted that a female northern harrier was observed hunting on a bombing range in Mississippi during bombing exercises (1988). The harrier was apparently unfazed by the exercises, even when a bomb exploded within 200 feet. In a similar case of habituation/non-disturbance, a study on the Florida snail-kite stated that the greatest reaction to overflights (approximately 98 dBA) was “watching the aircraft fly by.” No detrimental impacts to distribution, breeding success, or behavior were noted.

Bald Eagle. A study by Grubb and King on the reactions of the bald eagle to human disturbances showed that terrestrial disturbances elicited the greatest response, followed by aquatic (i.e., boats) and aerial disturbances (1991). The disturbance regime of the area where the study occurred was predominantly characterized by aircraft noise. The study found that pedestrians consistently caused responses that were greater in both frequency and duration. Helicopters elicited the highest level of aircraft-related responses. Aircraft disturbances, although the most common form of disturbance, resulted in the lowest levels of response. This low response level may have been due to habituation; however, flights less than 170 meters away caused reactions similar to other disturbance types. Ellis et al. showed that eagles typically respond to the proximity of a disturbance, such as a pedestrian or aircraft within 100 meters, rather than the noise level (1991). They also noted that helicopters were four times more likely to cause a reaction than a commercial jet and 20 times more likely to cause a reaction than a propeller plane. Fraser et al. have suggested that raptors habituate to overflights rapidly, sometimes tolerating aircraft approaches of 65 feet or less (1985).

Osprey. A 1998 study by Trimper et al. in Goose Bay, Labrador, Canada, focused on the reactions of nesting osprey to military overflights by CF-18 Hornets. Reactions varied from increased alertness and focused observation of planes to adjustments in incubation posture. No overt reactions (e.g., startle response, rapid nest departure) were observed as a result of an overflight. Young nestlings crouched as a result of any disturbance until they grew to 1 to 2 weeks prior to fledging. Helicopters, human presence, float planes, and other ospreys elicited the strongest reactions from nesting ospreys. These responses included flushing, agitation, and aggressive displays. Adult osprey showed high nest occupancy rates during incubation regardless of external influences.

The osprey observed occasionally stared in the direction of the flight before it was audible to the observers. The birds may have been habituated to the noise of the flights; however, overflights were strictly controlled during the experimental period. Strong reactions to float planes and helicopter may have been due to the slower flight and therefore longer duration of visual stimuli rather than noise-related stimuli.

Red-Tailed Hawk. Andersen et al. conducted a study that investigated the effects of low-level helicopter overflights on 35 red-tailed hawk nests (1989). Some of the nests had not been flown over prior to the study. The hawks that were naïve (i.e., not previously exposed) to helicopter flights exhibited stronger avoidance behavior (nine of 17 birds flushed from their nests) than those that had experienced prior overflights. The overflights did not appear to affect nesting success in either study group. These

findings were consistent with the belief that red-tailed hawks habituate to low-level air traffic, even during the nesting period.

H.2.8.6 Migratory Waterfowl

A study of caged American black ducks was conducted by Fleming et al. in 1996. It was determined that noise had negligible energetic and physiologic effects on adult waterfowl. Measurements included body weight, behavior, heart rate, and enzymatic activity. Experiments also showed that adult ducks exposed to high noise events acclimated rapidly and showed no effects.

The study also investigated the reproductive success of captive ducks, which indicated that duckling growth and survival rates at Piney Island, North Carolina, were lower than those at a background location. In contrast, observations of several other reproductive indices (i.e., pair formation, nesting, egg production, and hatching success) showed no difference between Piney Island and the background location. Potential effects on wild duck populations may vary, as wild ducks at Piney Island have presumably acclimated to aircraft overflights. It was not demonstrated that noise was the cause of adverse impacts. A variety of other factors, such as weather conditions, drinking water and food availability and variability, disease, and natural variability in reproduction, could explain the observed effects. Fleming noted that drinking water conditions (particularly at Piney Island) deteriorated during the study, which could have affected the growth of young ducks. Further research would be necessary to determine the cause of any reproductive effects.

Another study by Conomy et al. exposed previously unexposed ducks to 71 noise events per day that equaled or exceeded 80 dBA (1998). It was determined that the proportion of time black ducks reacted to aircraft activity and noise decreased from 38 percent to 6 percent in 17 days and remained stable at 5.8 percent thereafter. In the same study, the wood duck did not appear to habituate to aircraft disturbance. This supports the notion that animal response to aircraft noise is species-specific. Because a startle response to aircraft noise can result in flushing from nests, migrants and animals living in areas with high concentrations of predators would be the most vulnerable to experiencing effects of lowered birth rates and recruitment over time. Species that are subjected to infrequent overflights do not appear to habituate to overflight disturbance as readily.

Black brant studied in the Alaskan Peninsula were exposed to jets and propeller aircraft, helicopters, gunshots, people, boats, and various raptors. Jets accounted for 65 percent of all the disturbances. Humans, eagles, and boats caused a greater percentage of brant to take flight. There was markedly greater reaction to Bell-206-B helicopter flights than fixed wing, single-engine aircraft (Ward et al. 1986).

Manci et al. reported that waterfowl were particularly disturbed by aircraft noise (1988). The most sensitive appeared to be snow geese. Canada geese and snow geese were thought to be more sensitive than other animals such as turkey vultures, coyotes, and raptors (Edwards et al. 1979).

H.2.8.7 Wading and Shore Birds

Black et al. studied the effects of low-altitude (less than 500 feet above ground level) military training flights with sound levels from 55 to 100 dBA on wading bird colonies (i.e., great egret, snowy egret, tricolored heron, and little blue heron) (1984). The training flights involved three or four aircraft, which occurred once or twice per day. This study concluded that the reproductive activity—including nest success, nestling survival, and nestling chronology—was independent of F-16 overflights. Dependent variables were more strongly related to ecological factors, including location and physical characteristics of the colony and climatology. Another study on the effects of circling fixed-wing aircraft and helicopter overflights on wading bird colonies found that at altitudes of 195 to 390 feet, there was no reaction in nearly 75 percent of the 220 observations. Ninety percent displayed no reaction or merely looked toward the direction of the noise source. Another 6 percent stood up, 3 percent walked from the nest, and 2 percent flushed (but were without active nests) and returned within 5 minutes (Kushlan 1979). Apparently, non-nesting wading birds had a slightly higher incidence of reacting to overflights than nesting birds. Seagulls observed roosting near a colony of wading birds in another study remained at their roosts when subsonic aircraft flew overhead (Burger 1981). Colony distribution appeared to be most directly correlated to available wetland community types and was found to be distributed randomly with respect to military training routes. These results suggest that wading bird species presence was most closely linked to habitat availability and that they were not affected by low-level military overflights (Air Force 2000).

Burger studied the response of migrating shorebirds to human disturbance and found that shorebirds did not fly in response to aircraft overflights, but did flush in response to more localized intrusions (i.e., humans and dogs on the beach) (1986). Burger studied the effects of noise from JFK Airport in New York on herring gulls that nested less than 1 kilometer from the airport (1981). Noise levels over the nesting colony were 85 to 100 dBA on approach and 94 to 105 dBA on takeoff. Generally, there did not appear to be any prominent adverse effects of subsonic aircraft on nesting, although some birds flushed when a Concorde flew overhead and, when they returned, engaged in aggressive behavior. Groups of gulls tended to loaf in the area of the nesting colony, and these birds remained at the roost when the Concorde flew overhead. Up to 208 of the loafing gulls flew when supersonic aircraft flew overhead. These birds would circle around and immediately land in the loafing flock (Air Force 2000).

In 1970, sonic booms were potentially linked to a mass hatch failure of Sooty Terns on the Dry Tortugas (Austin et al. 1970). The cause of the failure was not certain, but it was conjectured that sonic booms from military aircraft or an overgrowth of vegetation were factors. In the previous season, Sooties were observed to react to sonic booms by rising in a “panic flight,” circling over the island, and then usually settling down on their eggs again. Hatching that year was normal. Following the 1969 hatch failure, excess vegetation was cleared and measures were taken to reduce supersonic activity. The 1970 hatch appeared to proceed normally. A colony of Noddies on the same island hatched successfully in 1969, the year of the Sooty hatch failure.

Subsequent laboratory tests of exposure of eggs to sonic booms and other impulsive noises (Bowles et al. 1991; Bowles et al. 1994; Cogger and Zegarra 1980) failed to

show adverse effects on the hatching of eggs. A structural analysis (Ting et al. 2002) showed that, even under extraordinary circumstances, sonic booms would not damage an avian egg.

Burger observed no effects of subsonic aircraft on herring gulls in the vicinity of JFK International Airport (1981). The Concorde aircraft did cause more nesting gulls to leave their nests (especially in areas of higher density of nests), causing the breakage of eggs and the scavenging of eggs by intruder prey. Clutch sizes were observed to be smaller in areas of higher-density nesting (presumably due to the greater tendency for panic flight) than in areas where there were fewer nests.

H.2.8.8 Fish, Reptiles, and Amphibians

The effects of overflight noise on fish, reptiles, and amphibians have been poorly studied, but conclusions regarding their expected responses have involved speculation based upon known physiologies and behavioral traits of these taxa (Gladwin et al. 1988). Although fish do startle in response to low-flying aircraft noise, and probably to the shadows of aircraft, they have been found to habituate to the sound and overflights. Reptiles and amphibians that respond to low frequencies and those that respond to ground vibration, such as spadefoots (genus *Scaphiopus*), may be affected by noise. Limited information is available on the effects of short-duration noise events on reptiles. Dufour in 1980 and Mancini et al. in 1988, summarized a few studies of reptile responses to noise. Some reptile species tested under laboratory conditions experienced at least temporary threshold shifts or hearing loss after exposure to 95 dB for several minutes. Crocodilians in general have the most highly developed hearing of all reptiles. Crocodile ears have lids that can be closed when the animal goes under water. These lids can reduce the noise intensity by 10 to 12 dB (Wever and Vernon 1957). On Homestead Air Reserve Station, Florida, two crocodilians (the American Alligator and the Spectacled Caiman) reside in wetlands and canals along the base runway suggesting that they can coexist with existing noise levels of an active runway including DNLs of 85 dB.

H.2.8.9 Summary

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied. Therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance one study suggests

that wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

H.2.9 Property Values

There are a number of factors that affect property values, which makes predicting impacts difficult. Factors directly related to the property, such as size, improvements, and location of the property, as well as current conditions in the real estate market, interest rates, and housing sales in the area are more likely to have a direct adverse impact on property values. Several studies have analyzed property values as they relate to military and civilian aircraft noise. In one study, a regression analysis of property values as they relate to aircraft noise at two military installations was conducted (Fidell et al. 1996). This study found that, while aircraft noise at these installations may have had minor impacts on property values, it was difficult to quantify that impact. Other factors such, as the quality of the housing near the installations and the local real estate market, had a larger impact on property values. Therefore, the regression analysis was not able to predict the impact of aircraft noise on the property values of two comparable properties.

Another study analyzed 33 other studies attempting to quantify the impact of noise on property values (Nelson 2003). The result of the study supports the idea that the potential for an adverse impact on property values as a result of aircraft noise exists and estimates that the value of a specific property could be discounted between 0.5 and 0.6 percent per decibel when compared to a similar property that is not impacted by aircraft noise. Additional data indicates that the discount for property values as a result of noise would be higher for noise levels above 75 dB DNL.

H.2.10 Subsonic Aircraft Noise Effects on Structures

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonance. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (CHABA 1977). A study directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or “rattle,” of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

H.2.11 Subsonic Aircraft Noise Effects on Structure and Terrain

Members of the public often believe that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures in mountainous areas. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

H.2.12 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Most scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on standing architecture. For example, the FAA published a study of potential impacts resulting from vibrations caused by the noise of subsonic Concorde overflights on five historic properties, including a restored plantation house, a stone bridge and tollhouse, and other structures (Hershey, Kevala, and Burns 1975). This study analyzed the breakage probabilities of structural elements that might be considered susceptible to vibration, such as window glass, mortar, and plaster. The results indicated that, with the exception of some already cracked window glass, there was no practical risk of noise-induced vibration damage to any of these structures.

Some studies of the effects of overflights—both subsonic and supersonic—on archaeological structures and other types of sites also have been published. Battis examined the effects of low-altitude overflights of B-52, RF-4C, and A-7 aircraft on

standing walls at Long House Ruin in northeastern Arizona (Battis 1988). The motion levels observed during all passes were well below a conservative threshold for vibration in ancient structures, a level of 1.3 millimeters per second, established by two previous studies. Battis concluded that vibration associated with aircraft overflights at speeds and altitudes similar to those measured in his study had/would have no significant damaging effect on Long House and similar sites.

Two Air Force-sponsored studies have included research into potential effects of supersonic overflight on “nonstructural” archaeology and unconventional structures. One study included historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites and rock art, and seismically sensitive areas such as avalanche and mud/rock slide areas (Sutherland, Brown, and Goerner 1990). That study compared overpressure associated with different types of aircraft in supersonic flight at different altitudes with failure or damage stress values for these types of sites. The authors concluded that overpressures generated by supersonic overflight were well below established damage thresholds. Subsonic operations—which were not included in this study—would be even less likely to cause damage.

Battis also completed a study that examined the potential for damage by sonic booms to rock shelter and petroglyph sites located within the Valentine Military Operations Area (MOA) in Texas (Battis 1983). The Texas State Historic Preservation Office (SHPO) helped design and participated in this study, which involved taking measurements at a rock shelter site and at a field of petroglyphs-bearing boulders during supersonic overflights. The peak overpressure for booms generated during supersonic operations over the Valentine MOA was 5.2 psf. The lower limit (the least amount of pressure needed) for damaging rock was measured in the laboratory at 2.1×10^4 psf, 4,000 times the peak overpressure measured during the study.

Air Force National Environment Policy Act documents have examined the potential impacts on historic properties that might result from subsonic and supersonic overflights. In 1995, the Air Force published the Environmental Assessment for Continued Supersonic Operations in the Black Mountain Supersonic Corridor and the Alpha/Precision Impact Range Area. Eligible and potentially eligible cultural resources in the area of potential effect include petroglyph and pictograph panels located on a variety of rock types, historic adobe and non-adobe structures with standing walls, and historic mines (which contain tunnels) and wells. The report concludes that supersonic low-altitude flights have occurred over these corridors for 25 years or more and have resulted in no significant impacts on cultural resources. The California SHPO agreed, and during National Historic Preservation Act Section 106 review of this undertaking, concurred with the Air Force’s finding that continued supersonic overflights would have no effect on historic properties.

As noted above for the noise effects of noise-induced vibrations on normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

H.3 NOISE MODELING METHODOLOGY USED IN GLI EIS

Noise modeling for the GLI EIS was conducted based on operations parameters contained in Section 2.3.2 in the EIS and inputs from 1 Special Operations Wing (SOW) and Florida Forest Service points of contact. Where operational details cannot be known due to the highly variable nature of the proposed training, conservative assumptions were made to avoid under-estimating impacts. Methods, known operational parameters, and assumptions used in calculating noise levels are described below.

H.3.1 Aircraft Noise Modeling Methods

An aircraft in subsonic flight generally emits noise from two sources: the engines and flow noise around the airframe. Noise generation mechanisms are complex and, in practical models, the noise sources must be based on measured data. The Air Force has developed a series of computer models and aircraft noise databases for this purpose. The models include NOISEMAP (Moulton 1992) and Rotorcraft Noise Model (RNM) (Wyle Laboratories 2002) for noise around airbases or in areas where operations would follow a definable path. The program MOA-Range NOISEMAP (MR_NMAP) (Lucas and Calamia 1996) was created for estimating noise levels in MOAs, ranges, and low-level training routes. The programs NOISEMAP and MRNMAP use the NOISEFILE database developed by the Air Force. NOISEFILE data includes SEL and L_{max} as a function of speed and power setting for aircraft in straight flight. The program RNM uses a separate measured source noise dataset which accounts for the high degree of sound level variability at different angles from the nose of the aircraft.

Noise from an individual aircraft is a time-varying continuous sound. It is first audible as the aircraft approaches, increases to a maximum when the aircraft is near its closest point, then diminishes as it departs. The noise depends on the speed and power setting of the aircraft and its trajectory. NOISEMAP divides the trajectory into segments whose noise can be computed from the data in NOISEFILE. The contributions from these segments are summed.

Operational points of contact estimated that for all GLI training event types approximately 20 percent of operations occur after 10 p.m. and before 7 a.m. As described in Section [H.1.2.4](#), operations after 10 p.m. and before 7 a.m. are assessed a noise ‘penalty’ in calculation of the noise metric Day-Night Average sound Level (DNL) because noise in this time period is generally more intrusive.

H.3.1.1 Noise Modeling Method for Landing Zones (LZs) and Drop Zones (DZs)

Several different aircraft types would use the LZs. Because the percent of total use by each aircraft type is not known, the loudest aircraft type was used as a noise surrogate for all aircraft types. Aircraft noise levels were compared for the aircraft while operating in the loudest configuration (e.g., power setting, airspeed, etc.) that would be commonly used while operating over the state forests. The CV-22 would be the type of rotorcraft used most commonly at the LZ/DZs. When operating at 60 degrees nacelle tilt, the CV-22 is louder than the other rotorcraft types expected to be frequently involved in GLI

training while they are operating in common training configurations (see Table 3-9 in Section 3.3.3 of the EIS).

To model conservatively, it was assumed that all noise would be concentrated along a single flight path. In fact, noise would be distributed across a range of possible inbound and outbound paths and time-average noise levels would be lower at any given location than those presented in the EIS. CV-22 typical approaches profiles created based on the “Approach Pattern” published in AFTTP 3-3 CV-22 and departure flight profile based on data gathered from a V-22 pilot. CV-22 flight profiles used in noise modeling are shown in [Figure H-7](#).

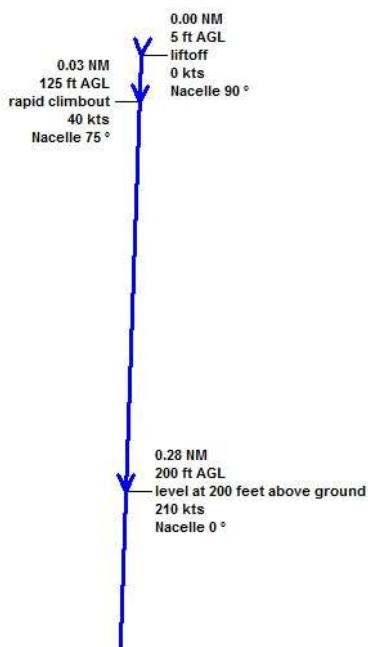


Figure H-7. CV-22 Approach to LZ/DZ and Departure from LZ/DZ Flight Profiles

Table H-4. CV-22 Weighted Average Number of Aircraft Per Sortie

# Aircraft	% Total Sorties
4	2%
2	49%
1	49%
Weighted Average Number of Aircraft	1.55

As stated in Section 2.3.2.1 of the EIS, up to eight LZ/DZs may be active at one time. Except for the following instances, one-eighth of total training events would be expected to occur at each LZ/DZ. Blackwater Airfield is proposed to accommodate fixed-wing training in addition to other training events that take place at all LZ/DZs. Personnel airdrops would only be permitted at BW12 under Subalternative 1 while container/CDS airdrops would only be permitted at BW6 and BW7. Noise levels were calculated for each LZ according to its specific proposed usage patterns.

To accurately capture variable noise directivity (i.e., noise level varies by degrees off nose of aircraft AND aircraft nose direction varies for each hover event), hovering was modeled as CV-22 flying slowly around a circular track with a radius of 75 feet. Time spent on the ground with engines running was modeled as “hover” at 5 AGL.

Low Level Helicopter Insertion/Extraction (LLHI/E). Under the Proposed Action, these operations would take place approximately two times per month. Under Subalternative 1, this training would be conducted eight times per year (less than once per month). It was assumed that, on average, 1.55 aircraft would participate in each event. It was assumed that 5 minutes would be spent conducting each circling pattern and 10 minutes would be spent conducting each upwind/downwind pattern. Average total time for each training event is 75 minutes, with time split evenly between hovering and closed patterns. Twenty percent of hovering time would be spent on the ground, with the remaining hover time split evenly between 75 AGL, 35 AGL and 15 AGL.

Air Drop (AD). Under the Proposed Action, airdrop operations would take place approximately four times per day on 232 days per year. Under Subalternative 1, airdrop of personnel would be conducted four days per year and equipment/CDS airdrops would be conducted 40 times per year. Multiple aircraft types would use the DZs. The C-130 was used as noise surrogate for all types. Although the C-17 is slightly louder than the C-130, it was estimated that the C-17 would conduct airdrops much less frequently than C-130 aircraft. Operations were modeled conducting drops from 500 AGL at 165 knots and 86 % NC. Airdrops would occur at 500 AGL and 700 C TIT engine power.

Air/Land Vertical Lift (A/LVL). Under the Proposed Action and Subalternative 1, A/LVL operations would take place approximately four times per day, 232 days per year. It was assumed that A/LVL training events would spend the same amount of training time in configurations as described above for Low Level Helicopter Insertion/Extraction training. In addition to training at the LZ/DZs, A/LVL operations would also take place at Blackwater Airfield.

[Table H-7](#) in Section [H.3.1.5](#) shows the frequency of each of the operations types mentioned above for the LZ/DZs. As previously mentioned, it was assumed that eight LZ/DZs would be operational at a time.

H.3.1.2 Noise Modeling Method for Blackwater Airfield

Several aircraft types would be used for LAPT training at the airstrips. Characteristics of aircraft types proposed to be used in training (see [Table H-5](#)) were compared to similar aircraft types available in DoD database of aircraft noise levels (see [Table H-6](#)). The C-23 Sherpa was selected as the surrogate noise source because it would be expected to be only slightly louder than the loudest of the training aircraft, based on the horsepower and number of engines with which it is equipped. Selection of a noise surrogate aircraft slightly louder than the training aircraft yields conservative analysis results.

Table H-5. Aircraft Proposed for Use in Fixed-Wing A/LVL

Aircraft	# of Engines	Engine Type	Horsepower per Engine
CASA-212	2	TPE331-10R-513C	900
PC-12	2	P+W PT6A-42 turboprops	850
C-145/ M-28 Skytruck	2	P+W PT6A-65B turboprops	1,100

Table H-6. Potential Surrogates in NOISEMAP

Aircraft	# of Engines	Engine Type	Horsepower per Engine
Beech Baron 58P	2	Continental IO-470L piston	260
C-23 Sherpa	2	P+W PT6A-45-R turboprop	1,198
Cessna 441 Conquest	2	Garrett TPE331-8-403S turboprops	636
T-6 Texan (JPATS)	1	P+W R-1340-AN-1	600
C-7 (DHC-4 Caribou)	2	P+W R20007M2	1,450

Flight tracks, altitude, engine power and airspeed would vary by aircraft type and operation type. To model conservatively, it was assumed that all operations would be concentrated on a single straight-in track for arrivals and on a single straight-out track for departures. At Blackwater Airfield, aircraft would arrive from and take off to the north while utilizing the northern half of the runway. This restriction on operations would shift noise away from the Munson Recreation Area that is located just south of the airstrip.

Standard aircraft profiles (i.e., altitude, engine power, and airspeed) for C-23 were used in modeling, except that the standard C-23 takeoff roll was shortened so that rotation would occur before the airstrip ends. Standard aircraft climb rates are for average aircraft loading. Aircraft conducting fixed-wing A/LVL would not be expected to be heavily loaded. Use of the standard profile puts aircraft slight lower and/or at higher engine power setting, which is also a conservative assumption. Flight profiles used in noise modeling of noise at Blackwater Airfield are shown in [Figure H-8](#).

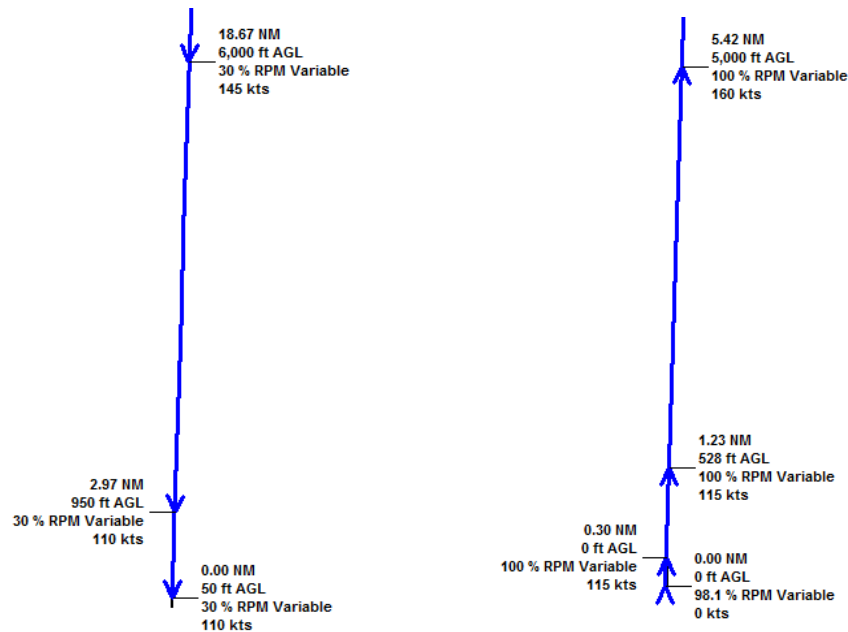


Figure H-8. C-23 Approach to Airstrip and Departure from Airstrip Flight Profiles

In addition to fixed-wing A/LVL, Blackwater Airfield will also support rotorcraft A/LVL training. A/LVL training was modeled as being split evenly between eight active LZ/DZs, including Blackwater Airfield. [Table H-7](#) in Section [H.3.1.5](#) shows the frequency of each of the operations types

H.3.1.3 Noise Modeling Method for Overwater Hoist Operations

Overwater Hoist Operations would occur approximately once per month and would last for approximately 20 minutes. V-22 aircraft, which would conduct the majority of training operations were used as surrogate noise source aircraft. CV-22 aircraft typically hover at approximately 80 feet AGL during the training event. [Table H-9](#) in Section [H.3.1.5](#) shows the frequency of the OHOs. The number of locations to be used for OHO is unknown. As a conservative estimate, it was assumed that all operations would occur at the same location.

H.3.1.4 Noise Modeling Method for Distributed Flying Operations

Aircraft would maneuver to and from designated training locations used variable flight paths. Noise levels associated with these maneuvers were modeled using the program MRNMAP. Operations were distributed evenly across the modeled area with the same acreage as BRSF. The same method was applied to THSF. In order to account for more frequent use of certain areas within the state forests, several conservative operational assumptions were made during noise modeling. The C-23 was used as a surrogate for fixed-wing A/LVL, the C-130H as a surrogate for Airdrop, and H-47 as a surrogate for all other ops (V-22 is not available in MRNMAP available aircraft noise database; H-47 has similar noise level and would be used in some GLI events). [Table H-10](#) in Section [H.3.1.5](#) shows the frequency distributed flying operations.

H.3.1.5 Operations Frequency

The tables below show the operations frequency for the various training type that would occur in BRSF and THSF. [Table H-7](#) shows the different event types that occur at the LZ/DZs and the frequency of each training event type. [Table H-8](#) shows the frequency of operations at the airstrips. [Table H-9](#) shows the frequency of OHOs. [Table H-10](#) shows the frequency aircraft flying to and from training events within BRSF and THSF.

Table H-7. Frequency of Operations at the LZ/DZs (including Blackwater Airfield)

Event	Operations Frequency	Total Events per AAD ¹	Avg # Aircraft per Event	% Total Events at each HLZ/DZ ²	Day Sorties (80%) ³	Night Sorties (20%) ³	Avg # of Approaches per Event
LLHI/E (Proposed Action)	2X/mo	0.066	1.55	13%	0.010	0.003	1
Airdrop (Proposed Action)	4X/day on 232 days per year	2.542	1	13%	0.254	0.064	1
A/LVL (Proposed Action)	4X/day on 232 days per year	2.542	1.55	13%	0.394	0.099	1
LLHI/E (Subalternative 1)	8 days per year	0.066	1.55	13%	0.003	0.001	1
Personnel Airdrop (Subalternative 1)	4 days per year (at BW12 only)	2.542	1	100%	0.009	0.002	1
Equipment / CDS Airdrop (Subalternative 1)	40 days per year (at BW6 and BW7)	2.542	1	50%	0.048	0.012	1
A/LVL (Subalternative 1)	4X/day on 232 days per year	2.542	1.55	13%	0.394	0.099	1

AAD= Average Annual Day; A/LVL= Air/Land Vertical Lift; LLHI/E= Low Level Helicopter Insertion/Extraction.

- 1 Operations per AAD calculated by dividing total annual operations by 365; GLI training would occur on up to 232 days per year above threshold number of days for use of AAD IAW DoDI 4165.57.
- 2 The most popular LZ/DZ at BRSF/THSF assumed to be location for 13% of total LZ/DZ operations.
- 3 Approximately 20% of total operations would occur in 2200-0700 hours for all event types.

Table H-8. Frequency of Fixed-Wing A/LVL Operations

Event ¹	Operations Frequency	Total Events per AAD ¹	Avg # Aircraft per Event	Avg # of Approaches per Event	BRSF % Total Ops at Blackwater Airfield	Ops per AAD at each BRSF Airstrip	Day Sorties (80%) ²	Night Sorties (20%) ²
Fixed-Wing A/LVL	12 per year	0.033	1	1	100%	0.033	0.026	0.007

AAD= Average Annual Day; A/LVL= Air/Land Vertical Lift; LAPT= Light Aviation Proficiency Training.

- 1 A/LVL will have the same frequency of operations at the airstrips as listed under [Table H-7](#). Operations per AAD calculated by dividing total annual operations by 365; GLI training would occur on up to 232 days per year above threshold number of days for use of AAD IAW DoDI 4165.57.
- 2 Approximately 20% of total operations would occur in 2200-0700 hours for all event types.
- 3 25% of sorties remain at 13,000 - 20,000 MSL and do not use airstrips; 100% modeled using airstrips to ensure no underrepresentation.

Table H-9. Frequency of Overwater Hoist Operations (OHO)

Event	Operations Frequency	Total Events per AAD ¹	Avg # Aircraft per Event	# of Locations ²	Total Operations	Day Sorties (80%) ³	Night Sorties (20%) ³
OHO†	1 per month	0.033	1.55	1	0.051	0.041	0.010

AAD= Average Annual Day; OHO= Overwater Hoist Operation.

- 1 Operations per AAD calculated by dividing total annual operations by 365; GLI training would occur on up to 232 days per year above threshold number of days for use of AAD IAW DoDI 4165.57.
- 2 Approximately 20% of total operations would occur in 2200-0700 hours for all event types.
- 3 Number of locations to be used for OHO is not known; it was assumed all operations would occur at one location.

Table H-10. Frequency of Distributed Flying Operations

Event	Day Sorties per AAD (80%) ^{1,2}	Night Sorties per AAD (20%) ^{1,2}	Daytime Annual Operations	Nighttime Annual Operations
Air Drop (Proposed Action)	0.25	0.06	93	23
LZ/DZ and OHO (Proposed Action)	0.45	0.11	162	41
Air Drop (Subalternative 1)	0.06	0.01	21	5
LZ/DZ and OHO (Subalternative 1)	0.44	0.11	160	40

AAD= Average Annual Day; LAPT= Light Aviation Proficiency Training; LZ/DZ= Helicopter Landing Zone/ Drop Zone; OHO= Overwater Hoist Operation.

- 1 Operations per AAD calculated by dividing total annual operations by 365; GLI training would occur on up to 232 days per year above threshold number of days for use of AAD IAW DoDI 4165.57.
- 2 Daytime and nighttime sorties were calculated by multiplying the total events per AAD by the number of aircraft per event by the percent day/night (see [Table H-7](#), [Table H-8](#), and [Table H-9](#)).

H.3.2 Munitions Noise Modeling Methods

The programs BNOISE2 and Small Arms Range Noise Assessment Model (SARNAM) calculate noise levels generated by large arms and small arms, respectively. Large arms are defined as being weapons firing rounds 20 mm or larger, while small arms are defined as weapons firing projectiles less than 20 mm in diameter. Both BNOISE2 and SARNAM calculate munitions noise based on recorded noise levels for several weapon and projectile types using a series of noise propagation algorithms. Calculations include the muzzle blast as well as the shockwave generated by the projectile, which often travels at faster than the speed of sound. The programs are capable of generating several noise metrics including CDNL and peak noise level.

Because it is not known how widely munitions training would be spaced out, training areas were treated as if all activities would occur at one point on the ground at each training location. It was assumed that training events would be evenly distributed between two hardened campsites within BRSF. At THSF, it is not known how training will be distributed, and it was also assumed that there would be two training locations. Noise levels are based on the listener being 90 degrees offset from muzzle of the gun (i.e., perpendicular to the noise source and the target).

Army Regulation 200-1 discourages noise-sensitive land use where large arms noise exceeds 62 dB CDNL and strongly discourages noise-sensitive land uses where large-arms noise exceeds 70 dB CDNL. As described in Army Regulation 200-1, noise-sensitive land use where small-arms noise exceeds 87 dB PK 15(met) (i.e., peak noise level) is discouraged and noise-sensitive land uses where small-arms noise exceeds 104 dB PK 15(met) is strongly discouraged.

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APPENDIX I

MEMORANDA OF AGREEMENT

I. MEMORANDA OF AGREEMENT

I.1 AIR FORCE, FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES, & FLORIDA FOREST SERVICE (MILITARY TRAINING ON STATE LANDS)

MEMORANDUM OF AGREEMENT BETWEEN
THE DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE FOR INSTALLATIONS
PENTAGON, WASHINGTON, D.C. 20330
AND
FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES
FLORIDA FOREST SERVICE
TALLAHASSEE, FL 32399
FOR THE PROVISION OF MILITARY TRAINING ON STATE LANDS

THIS MEMORANDUM OF AGREEMENT (hereafter, the "Agreement") is made and entered into this ____ day of October, 2012 by and between Office of the Assistant Secretary of the Air Force for Installations (hereinafter, "Air Force") and Florida Department of Agriculture and Consumer Services, Florida Forest Service (hereinafter, "Florida Forest Service") which collectively are the "Parties".

WITNESSETH:

WHEREAS, the Air Force, in order to successfully accomplish mission requirements, has a need for expanded training opportunities in Northwest Florida beyond the current Department of Defense lands and training areas, and

WHEREAS, the Florida Forest Service is responsible for managing, protecting, maintaining and developing Florida State forests and support sites, and

WHEREAS, the Parties have mutually concluded that it is desirable, practicable, and beneficial for the Parties to enter this Agreement to the mutual benefit of both and the goal is to work together in an effort to enhance both Parties' ability to carry out their respective missions,

NOW, THEREFORE, BE IT AGREED THAT:

1. Military training operations on Florida State forest managed lands and support sites can be compatible to achieve the Parties's objectives without unreasonable impacts to resources if conducted with the proper planning and coordination.
2. Within 60 days of enactment of this Agreement, Florida Forest Service personnel and Air Force personnel will work together to develop a detailed "Annual Operations Plan" that:
 - a. Establishes a framework through which military training exercises may be conducted on State-owned lands managed as state forests and support sites. This framework may include other appropriate instruments within the jurisdiction of both Parties.
 - b. Identifies number and locations of compatible available sites in the Northwest Florida region, to be defined as "training sites".
 - c. Provides detailed maps showing boundaries delineating training areas.
 - d. Details limitations of liability between the parties.
 - e. Estimates the frequency of use of the sites.
 - f. Indicates the types of compatible training allowed and the training activities that are expected to be prohibited.
 - g. Establishes procedures for requesting, cancelling, coordinating and notification of the use of training sites.

- h. Identifies options for compensation or reimbursement for the Florida Forest Service providing lands for training through cash payment or in-kind services.
- i. Establishes a feedback mechanism to assess the usefulness of the training site for the Air Force and the impact, if any, upon the mission of the Florida Forest Service.
- j. Identifies and clarifies the Air Force's responsibility with regard to the National Environmental Policy Act (NEPA).

EXECUTION OF THIS AGREEMENT:

3. This Agreement shall become effective upon the date first annotated above, and shall remain in full force and effect until cancelled by mutual agreement of the Parties, or upon the provision of at least sixty (60) days advance written notice from the Party desiring to terminate this Agreement to the other Party. Upon becoming effective, this Agreement shall supersede all previous agreements between the Parties on the same subject.

IN WITNESS WHEREOF, authorized representatives of the Parties have affixed their signatures hereto, in recognition and acceptance of the terms, conditions and obligations set forth and or assumed under this Agreement.

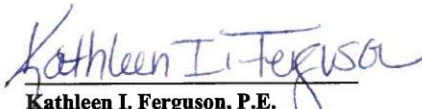
**Florida Department of Agriculture and
Consumer Services:**



Adam H. Putnam, Commissioner

DATE: 10/23/12

Department of the Air Force:



Kathleen I. Ferguson, P.E.
Principal Deputy Assistant Secretary
(Installations, Environment & Logistics)

Pentagon, Washington, D.C.

DATE: 10/23/12

**Florida Department of Agriculture and
Consumer Services, Florida Forest Service**



James R. Karels, Director

DATE: 10/23/12

I.2 AIR FORCE, FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (MILITARY COMMUNICATIONS EQUIPMENT ON STATE LANDS)

MEMORANDUM OF AGREEMENT BETWEEN
THE PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE FOR
INSTALLATIONS, ENVIRONMENT AND LOGISTICS
PENTAGON, WASHINGTON, D.C. 20330
AND
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
TALLAHASSEE, FL 32399
FOR THE DEPLOYMENT OF MILITARY COMMUNICATIONS EQUIPMENT ON STATE LANDS

THIS MEMORANDUM OF AGREEMENT (hereafter, "Agreement") is made and entered into this 10th day of December, 2012, by and between Office of the Assistant Secretary of the Air Force for Installations (hereinafter, "Air Force") and Florida Department of Environmental Protection (hereinafter, "Department") which collectively are the "Parties".

WITNESSETH:

WHEREAS, the Air Force, in order to successfully accomplish mission requirements, has a need for expanded operations in Northwest Florida beyond the current Department of Defense lands; and

WHEREAS, the Department is responsible for managing, protecting, maintaining and developing Florida's state parks and coastal and aquatic managed areas; and

WHEREAS, the Parties have mutually concluded that it is desirable, practicable and beneficial for the Parties to enter this Agreement for the mutual benefit of both, the goal of which is to work together in an effort to enhance both Parties' ability to carry out their respective missions,

NOW, THEREFORE, BE IT AGREED THAT:

1. Deploying non-hazardous, no-impact military communications equipment on Department-managed lands can be conducted in a way that achieves the objectives of the Parties without impacts to the natural and cultural resources and public recreational use of these lands if done with proper planning and coordination.
2. Within 60 days of execution of this Agreement, Department personnel and Air Force personnel will work together to develop a detailed plan that:
 - a. Establishes a framework through which non-hazardous, no-impact military communications equipment, referred to as threat emitters, can be positioned on State-owned lands that are managed as state parks and coastal and aquatic managed areas. This framework may include the development of appropriate written instruments to authorize such activities within these lands.
 - b. Identifies those managed areas in the Northwest Florida region and the specific sites within each area where threat emitters can be deployed, to be defined as "deployment sites".
 - c. Provides detailed maps delineating the specific location and boundary of deployment sites.
 - d. Expresses the limitations of liability by the Parties.
 - e. Identifies the term during which the deployment sites will be used.

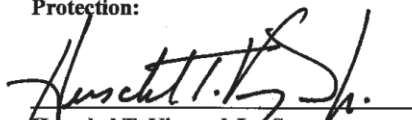
- f. Establishes procedures for coordinating the use of deployment sites between the Parties.
- g. Identifies options for compensation or reimbursement to the Department for providing lands for use as deployment sites, through cash payment or in-kind services.
- h. Establishes a feedback mechanism to assess the usefulness of the deployment sites for the Air Force and the impacts, if any, upon the mission of the Department.
- i. Identifies and clarifies the Air Force's responsibility with regard to the National Environmental Policy Act (NEPA).

EXECUTION OF THIS AGREEMENT:


- 3. This Agreement shall become effective upon the date first annotated above, and shall remain in full force and effect until cancelled by mutual agreement of the Parties, or upon the provision of at least sixty (60) days advance written notice from the Party desiring to terminate this Agreement to the other Party. Upon becoming effective, this Agreement shall supersede all previous agreements between the Parties on the same subject.

IN WITNESS WHEREOF, authorized representatives of the Parties have affixed their signatures hereto, in recognition and acceptance of the terms, conditions and obligations set forth and/or assumed under this Agreement.

Florida Department of Environmental
Protection:


Herschel T. Vinyard Jr., Secretary


Department of the Air Force:


Kathleen I. Ferguson, PE
Principal Deputy Assistant Secretary
(Installations, Environment & Logistics)


Pentagon, Washington, D.C.

DATE: 12/6/12

DATE: 12/10/12


Donald Forgione, Director
Division of Recreation and Parks

DATE: 12-10-12


Kevin Claridge, Director
Office of Coastal and Aquatic Managed Areas

DATE: 12/6/12

I.3 AIR FORCE, FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (MILITARY TRAINING ON STATE LANDS)

MEMORANDUM OF AGREEMENT BETWEEN
THE PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE FOR
INSTALLATIONS, ENVIRONMENT AND LOGISTICS
PENTAGON, WASHINGTON, D.C. 20330
AND
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
TALLAHASSEE, FL 32399
FOR THE PROVISION OF MILITARY TRAINING ON STATE LANDS

THIS MEMORANDUM OF AGREEMENT (hereafter, the "Agreement") is made and entered into by and between Office of the Principal Deputy Assistant Secretary of the Air Force for Installations, Environment and Logistics (hereinafter, "Air Force") and Florida Fish and Wildlife Conservation Commission (hereinafter, "Commission").

WITNESSETH:

WHEREAS, the Air Force, in order to successfully accomplish mission requirements has a need for expanded training opportunities in Northwest Florida beyond the current Department of Defense lands and training areas, and

WHEREAS, the Commission is responsible for managing, protecting, maintaining, and developing over 1.4 million acres of state conservation land ("Commission Lead-Managed Lands")

WHEREAS, the Parties have mutually concluded that it is desirable, practicable, and beneficial for the Parties to enter this Agreement to the mutual benefit of both and the goal is to work together in an effort to enhance both Parties.

NOW, THEREFORE, BE IT AGREED THAT:

1. Military training operations on the Commission Lead-Managed Lands in Northwest Florida can be compatible for both Parties without unreasonable impacts to resources if conducted with the proper planning and coordination.
2. Within 60 days of enactment of this Agreement, Commission staff and Air Force personnel will work together to develop a detailed "Annual Operations Plan" that:
 - a. Establishes a framework through which military training exercises may be conducted on State owned Commission Lead-Managed Lands. This framework may include other appropriate instruments within the jurisdiction of both Parties.
 - b. Identifies number and locations of compatible available sites in the Northwest Florida region, to be defined as "training sites".
 - c. Provides detailed maps showing boundaries delineating training areas.
 - d. Details limitations of liability between the parties.
 - e. Estimates the frequency of use of the sites.
 - f. Indicates the types of compatible training allowed and the training activities that are expected to be prohibited.
 - g. Establishes procedures for requesting, cancelling, coordinating and notification of the use of training sites.

- h. Identifies options for compensation or reimbursement for the Commission providing lands for training through cash payment or in-kind services.
- i. Establishes a feedback mechanism to assess the usefulness of the training site for the Air Force and the impact, if any, upon the mission of the Commission.
- j. Identifies and clarifies the Air Force's responsibility with regard to the National Environmental Policy Act (NEPA)

EXECUTION OF THIS AGREEMENT:

- 3. This Agreement shall become effective upon the date last signed below, and shall remain in full force and effect until cancelled by mutual agreement of the Parties, or upon the provision of at least sixty (60) days advance written notice from the Party desiring to terminate this Agreement to the other Party. Upon becoming effective, this Agreement shall supersede all previous agreements between the Parties on the same subject.
- 4. Unless a notice of change of address is given, any and all notices shall be delivered to the parties at the following addresses:

Commission

Mike Brooks
Section Leader
Wildlife and Habitat Management Section
620 South Meridian Street
Tallahassee, Florida 32399-1600
(850) 488-3831

Air Force

Kathleen I. Ferguson, P.E.
Principal Deputy Assistant Secretary
(Installations, Environment & Logistics)
Pentagon, Washington, D.C.
(703) 697-6300

IN WITNESS WHEREOF, authorized representatives of the Parties have affixed their signatures hereto, in recognition and acceptance of the terms, conditions and obligations set forth and or assumed under this Agreement.

**Florida Fish and Wildlife
Conservation Commission:**

Department of the Air Force:

Nick Wiley, Executive Director

Kathleen I. Ferguson, P.E.
Principal Deputy Assistant Secretary
(Installations, Environment & Logistics)
Pentagon, Washington, D.C.

DATE: _____

DATE: _____

I.4 AIR FORCE, NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT (MILITARY TRAINING ON DISTRICT LANDS)

**MEMORANDUM OF AGREEMENT BETWEEN
THE PRINCIPAL DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE FOR
INSTALLATIONS, ENVIRONMENT AND LOGISTICS
PENTAGON, WASHINGTON, D.C. 20330
AND
NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT
HAVANA, FL 32333
FOR THE PROVISION OF MILITARY TRAINING ON DISTRICT LANDS**

THIS MEMORANDUM OF AGREEMENT (hereafter, the "Agreement") is made and entered into by and between Office of the Principal Deputy Assistant Secretary of the Air Force for Installations, Environment and Logistics (hereinafter, "Air Force") and Northwest Florida Water Management District (hereinafter, "District").

WITNESSETH:

WHEREAS, the Air Force, in order to successfully accomplish mission requirements has a need for expanded training opportunities in Northwest Florida beyond the current Department of Defense lands and training areas, and

WHEREAS, the District has worked for decades to protect and manage water resources in a sustainable manner for the continued welfare of people and natural systems across its 16-county area; and

WHEREAS, the Parties have mutually concluded that it is desirable, practicable, and beneficial for the Parties to enter this Agreement to the mutual benefit of both and the goal is to work together in an effort to enhance both Parties.

NOW, THEREFORE, BE IT AGREED THAT:

1. Military training operations on District Lands in Northwest Florida can be compatible for both Parties without unreasonable impacts to water resources and natural systems if conducted with the proper planning and coordination.
2. Within 60 days of enactment of this Agreement, District staff and Air Force personnel will work together to develop a detailed "Annual Operations Plan" that:
 - a. Establishes a framework through which military training exercises may be conducted on District Lands. This framework may include other appropriate instruments within the jurisdiction of both Parties.
 - b. Identifies number and locations of compatible available sites in the Northwest Florida region, to be defined as "training sites".
 - c. Provides detailed maps showing boundaries delineating training areas.
 - d. Details limitations of liability between the parties.
 - e. Estimates the frequency of use of the sites.
 - f. Indicates the types of compatible training allowed and the training activities that are expected to be prohibited.
 - g. Establishes procedures for requesting, cancelling, coordinating and notification of the use of training sites.

- h. Identifies options for compensation or reimbursement for the District providing lands for training through cash payment or in-kind services.
- i. Establishes a feedback mechanism to assess the usefulness of the training site for the Air Force and the impact, if any, upon the mission of the District.
- j. Identifies and clarifies the Air Force's responsibility with regard to the National Environmental Policy Act (NEPA)

EXECUTION OF THIS AGREEMENT:

- 3. This Agreement shall become effective upon the date last signed below, and shall remain in full force and effect until cancelled by mutual agreement of the Parties, or upon the provision of at least sixty (60) days advance written notice from the Party desiring to terminate this Agreement to the other Party. Upon becoming effective, this Agreement shall supersede all previous agreements between the Parties on the same subject.
- 4. Unless a notice of change of address is given, any and all notices shall be delivered to the parties at the following addresses:

District

William O. Cleckley
 Division Director
 Division of Land Management & Acquisition
 81 Water Management Drive
 Havana, Florida 32399-1600
 (850) 539-5999

Air Force

Kathleen I. Ferguson, P.E.
 Principal Deputy Assistant Secretary
 (Installations, Environment & Logistics)
 Pentagon, Washington, D.C.
 (703) 697-6300

IN WITNESS WHEREOF, authorized representatives of the Parties have affixed their signatures hereto, in recognition and acceptance of the terms, conditions and obligations set forth and or assumed under this Agreement.

**Northwest Florida Water
 Management District:**

Department of the Air Force:

 Jonathan P. Steverson, Executive Director

 Kathleen I. Ferguson, P.E.
 Principal Deputy Assistant Secretary
 (Installations, Environment & Logistics)
 Pentagon, Washington, D.C.

DATE: _____

DATE: _____

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